Branch: Computer Science and Engineering

Course Code	HSM 401
Course Title	**PRINCIPLES OF MANAGEMENT**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	50 50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to make students understand the management process and principles along with its application in practical life and to help them manage different jobs and situations with the help of management functions.
Course Outcome	1. The students will be able to apply management concepts and principles in daily life and thus, will be able to manage things efficiently and effectively. 2. The students will learn how to get work done easily by using management knowledge and functions.

SYLLABUS

Note for Examiner*- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Introduction to Management
Nature of Management: Art or Science, Principles and Functions of Management

(3 hours)

Evolution of Management Thought
Classical Theories: Bureaucratic, Scientific and Administrative Approach
Neo-Classical Theories: Human Relations and Human Behaviour Approach
Modern Theories of Management
Relevance of Management Thought in present scenario – Management Cases

(6 hours)

Planning
Nature of Planning, Planning Process, Application of Planning Process in a Hypothetical Situation, Types of Planning, Types of Plans, Management by Objective (MBO)

(4 hours)

Organizing
Concept of Organization, Departmentation, Forms of Organization Structure
Analysis of Organization Structure – Case Studies

Hypothetical Formation of an Organization
New Methods of Managing Organizations

(4 hours)

SECTION-B

Staffing
Human Resource Planning: HRP Process, Job Analysis: Job Description, Job Specifications and Used of Job Analysis
Recruitment: Sources and Methods
Selection: Selection Process, Role Playing and Case Study on Selection Tests and Interviews
Training and Development: Techniques, Performance Appraisal: Methods
Case Study on Staffing Practices

(6 hours)

Directing
Concept, Leadership: Importance and Styles, Motivation: Theories and their relevance in present scenario, Communication: Process, Types and Barriers of Communication
Management Game on Leadership, Motivation and Communication

(3 hours)

Controlling
Nature and Process of Controlling, Requirements for Effective Controlling

(2 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Principles and Practices of Management	Rao V.S.P. and Narayana P.S.	Konark Publishers, 1987
2	Principles & Practice of Management	Prasad L.M.	8th Edition, Sultan Chand & Sons, 2012
3	Essentials of Management: International and Leadership Perspective	Weihrich H.and Koontz H.	Edition, McGraw Hill, 2012
4	The New Era of Management	Daft R.L	11th Edition, Cengage Learning, 2014
5	Management: Text and Cases	Rao V.S.P. and Krishna V.H	Excel Books, 2008
6	Fundamentals of Management: Essential Concepts and Applications	Robbins S.P, DeCenzo D.A., Bhattacharya S. and Agarwal M.N	6th Edition, Pearson India, 2009

Branch: Computer Science and Engineering

Course Code	HSM 402
Course Title	**BUSINESS ENVIRONMENT AND BUSINESS LAWS**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to make students understand different types of environment influencing business decisions and to provide knowledge about different laws that needs to be followed for initiating and managing business.
Course Outcome	1. The students will be able to analyze the impact of environment on business and formulate appropriate business strategies to compete in the competitive world. 2. The students will learn how companies follow corporate governance and social responsibility practices along with fulfilling economic objectives. 3. The students will gain knowledge about application and implementation of various business laws in practice.

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A
Introduction to Business
Scope and Characteristics of Business, Classification of Business Activities
Forms of Ownership of Business: Sole Proprietorship, Partnership and Company

(5 hours)

Business Environment
Internal Environment: Concept and Elements (Value System, Vision Mission Objectives, Management Structure, Human Resources, Company Image etc.)
SWOT Analysis: Concept and Case Study
External Environment: Micro Environment (Suppliers, Customers, Competitors, Market Intermediaries etc.) and Macro Environment – PESTEL Analysis (Political, Economic, Social, Technological, Ecological and Legal), Case Study on Impact of Environment on Business

(7 hours)

Globalization
Concept, Pros and Cons of Globalization, Impact of Global Environment on Business
Globalization of Company – Case Study

(4 hours)

SECTION-B

Corporate Social Responsibility
Concept, Social Responsibility towards different stakeholders, Rationale for CSR
CSR – Case Studies

(2 hours)

Corporate Governance
Concept, Elements and Essentials of Good Governance

(3 hours)

Contract Law
Concept, Types and Essentials Elements of Contract

(3 hours)

Partnership Law
Nature of Partnership, Provisions of Partnership Act, Issues Related to Partnership Firm,
Hypothetical Formation of a Partnership Firm

(2 hours)

Company Law
Nature of Company, Provisions of Company Act, Issues Related to Incorporation of Company,
Hypothetical Formation of a Company

(2 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Business Environment: Text and Cases	Cherunilam F	22nd Edition, Himalaya Publications, 2013
2	Legal Aspects of Business	Pathak A	5th Edition, McGraw Hill Education, 2013
3	Essential of Business Environment: Text, Cases and Exercises	Aswathappa K.	11th Edition, Himalaya Publication, 2011
4	Business Law Including Company Law	Gulshan S.S. and Kapoor G.K	15th Edition, New Age International (p) Ltd, 2011
5	Business Law and Corporate Laws	Tulsian P.C	1st Edition, Sultan Chand Publishing, 2011
6	Fundamentals of Business Organization & Management	Bhushan Y.K	19th Edition, Sultan Chand & Sons, 2013
7	Corporate Governance: Principles, Policies and Practices	Fernando A.C	2nd Edition, Pearson India, 2011
RECOMMENDED BOOKS			
1			

Branch: Computer Science and Engineering

Course Code	HSM 403
Course Title	**ENTREPRENEURSHIP AND PROJECT MANAGEMENT**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to make prospective engineers familiar with the concept of entrepreneurship and MSMEs and to provide knowledge about different aspects to be considered while formulating the business plan for a new entrepreneurial venture. This course also intends to create awareness among students about financial and marketing functions that is required for a new venture.
Course Outcome	1. The students will be able to apply engineering knowledge effectively in the field of entrepreneurship development. 2. The students can make effective use of entrepreneurial knowledge to start and manage their venture. 3. The students will learn to check the feasibility of a new project to maintain its long run sustainability.

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A

Introduction to Entrepreneurship
Concept of Entrepreneurship, Characteristics and Functions of Entrepreneur
Forms of Ownership of Business, Factors Affecting Entrepreneurship
Case Studies of Entrepreneurs

(6 hours)

Women Entrepreneurship
Nature of Women Entrepreneurship, Problems of Women Entrepreneurs, Institutional Initiatives for Promotion of Women Entrepreneurs

(2 hours)

Micro, Small and Medium Enterprises (MSMEs)

Concept of MSMEs, Schemes of MSMEs
Functions of Entrepreneurial Development Programmes (EDPs)

(2 hours)

Project Identification
Idea Generation, Project Life Cycle, Concept of SWOT Analysis
SWOT Analysis of Selected Project

(2 hours)

SECTION-B
Project Planning and Formulation
Elements of Project Formulation: Product, Technical (Location, Scale, Technology, Production Process, Layout, Manpower, Resources), Market, Finance and Economic Aspects
Feasibility Analysis: Financial Viability and Profitability, and Socio-Economic Desirability

(7 hours)

Project Report
Formulation of Business Plan and Project Report, Hypothetical Example of a Real-Life Project

(2 hours)

Finance and Marketing Function
Concept of Finance, Finance Related Terminologies, Sources of Finance, Cost Estimations
Marketing Mix: Product, Place, Price, Promotion, People, Process and Physical Evidence
Marketing Segmentation Targeting and Positioning

(5 hours)

Discussions on Additional Reading (any one of the following in the semester)
- The New Age Entrepreneurs
- The $100 Startup: Fire your Boss, Do what you Love and Work Better to Live More
- A Guide to Entrepreneurship
- Dhandha: How Gujaratis Do Business
- Rokda: How Baniyas Do Business
- Take Me Home
- Business Families of Ludhiana

(2 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Dynamics of Entrepreneurial Development & Management	Desai V.	5th Edition, Himalaya Publishing House.
2	Projects: Planning, Analysis, Selection, Financing, Implementation and Review	Chandra P	8th Edition, McGraw-Hill Education (India), 2014
3	Entrepreneur's Toolkit	Harvard Business School	Harvard University Press, 2004
4	Entrepreneurship	Hisrich R.D., Peters M.P. and Shepherd D.A	McGraw Hill Education, 2006
5	Essentials of Project Management	Ramakrishna K	PHI Learning
6	Entrepreneurship	Roy R	2nd Edition, Oxford University Press, 2011
7	Entrepreneurship Development in India	Gupta C.B. and Srinivasan N.P.	Sultan Chand and Sons, 2013

Branch: Computer Science and Engineering

Course Code	HSM 404
Course Title	**FINANCIAL MANAGEMENT**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods	
End Semester Assessment (University Exam.)	50
Continuous Assessment (Sessional, Assignments, Quiz)	50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to make students learn different financial decisions i.e. investing, financing and dividend, required to be taken by a company and provide knowledge about the functioning of the financial system (financial markets, financial institutions, financial services and financial instruments) of the country.
Course Outcome	1. The students will learn to make best combination of financial decisions by considering risk and return trade-off. 2. The students will identify how business can gain maximum through the financial system. 3. The students will understand how to manage funds effectively so as to maximize returns.

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A

Introduction to Financial Management
Concept of Finance, Terminology Related to Finance, Financial Decisions, Factors Affecting Financial Decisions, Risk-Return Trade-Off

(3 hours)

Financial System
Concept and Role of Financial System in Indian Economy

(2 hours)

Financial Markets and Instruments
Concept and Relevance of Money Market and Capital Market
Money Market Instruments: Call Money, Treasury Bills, Commercial Papers, Certificate of Deposits
Capital Market Instruments: Equity Shares, Preference Shares and Debentures
Hypothetical Trading in Financial Markets

(5 hours)

Financial Services
Nature and Functions of Financial Services: Merchant Banking, Mutual Funds, Factoring, Forfaiting, Credit Rating
Case Study on Financial Services

(6 hours)

SECTION-B
Financial Institutions
Nature and Functions of Financial Institutions: Reserve Bank of India (RBI), Securities and Exchange Board of India (SEBI), Discount and Finance House of India (DFHI)

(2 hours)

Long Term Investment Decisions
Capital Budgeting: Concept, Importance, Factors
Techniques/Methods with Numerical Applications (Pay Back Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return and Profitability Index), Case Study

(3 hours)

Short Term Investment Decisions
Working Capital: Nature, Type and Factors Affecting the Requirement of Working Capital, Case Study

(2 hours)

Financing Decisions
Capital Structure: Essentials and Approaches of Capital Structure
Sources of Finance (long-term and short-term), Financial Leverage: Concept and Numerical Application, Case Study

(3 hours)

Dividend Decisions
Types of Dividend, Dividend Policy: Nature and Factors Affecting Dividend Policy,
Case Study

(2 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Financial Management	Shah P.	2nd Edition, Dreamtech Press, 2009
2	Financial Markets and Services	Gordon E. and Natarajan K.	3rd Edition, Himalaya Publishing House, 2006
3	Financial Management: Theory and Practice	Chandra P.	8th Edition, McGraw Hill Education (India), 2012
4	Financial Management	Pandey I.M.	10th Edition, Vikas Publishing House Pvt. Ltd., Noida, 2010
5	Cases in Financial Management	Pandey I.M. and Bhat R.	3rd Edition, McGraw Hill Education (India), 2012
6	Financial Institutions and Markets: Structure, Growth and Innovations	Bhole L.M. and Mahakud J.	5th Edition, McGraw Hill Education (India), 2009
7	The Indian Financial System: Markets, Institutions and Services	Pathak B.V.	3rd Edition, Pearson India, 2010
8	Financial Management and Policy	Horne J.C.V. and Dhamija S.	12th Edition, Pearson India, 2011

Branch: Computer Science and Engineering

Course Code	HSM 405
Course Title	**MARKETING MANAGEMENT**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods	
End Semester Assessment (University Exam.)	50
Continuous Assessment (Sessional, Assignments, Quiz)	50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to make students understand about the marketing concepts to be applied in real life and the marketing process for delivering value to customers.
Course Outcome	1. The students will learn how to market goods and services effectively to different segments so as to deliver value to customers. 2. The students will be able to formulate marketing mix and marketing strategies for different products and different sets of customers.

SYLLABUS

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SECTION-A

Introduction to Marketing

Concepts, Role, Scope and Types of Marketing, Case Study on Marketing Management

(3 hours)

Marketing Research

Scope and Process of Marketing Research, Hypothetical Marketing Research Analysis

(3 hours)

Consumer and Business Markets

Types of Markets, Building Customer Value

Consumer and Business Buying Behaviour: Factors Influencing Behaviour and Buying Decision Process

(4 hours)

Selection of Markets

Segmentation: Factors and Bases, Targeting and Positioning

Preparation of STP of Selected Product

(3 hours)

Marketing Mix

7 P's of Marketing Mix: Product, Price, Physical Distribution, Promotion, People, Process and Physical Evidence

Formulation of Marketing Mix of Selected Product

SECTION-B

Product Decisions

Product (Good or Service) Characteristics, Product Life-Cycle, Packaging and Branding, Product Development and Management

(3 hours)

Pricing Decisions

Pricing Policies and Strategies, Factors Influencing Pricing

(3 hours)

Physical Distribution Decisions

Marketing Channels, Channel Players, Physical Distribution, Managing Distribution,
Analysis of Supply Chain Management – Case Studies

(3 hours)

Promotion Decisions

Nature of Promotion Decisions, Managing Mass Communication and Personal Communication
Analysis of Promotional Strategies – Case Studies

(3 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Marketing Management: Concepts, Cases, Challenges and Trends	Govindarajan M	2nd Edition, PHI Learning, 2009
2	Marketing Management	Kotler P., Keller K.L., Koshy A. and Jha M.	14th Edition, Pearson India, 2012
3	Marketing Concepts and Strategies	Dibb S., Simkin L., Pride W.M. and Ferrell O.C.	Cengage Learning, 2012
4	Marketing Management	Kumar A. and Meenakshi N	2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, 2011
5	Marketing Management	Saxena R.	4th Edition, McGraw Hill Education (India), 2013
6	Marketing: Managerial Introduction	Gandhi J.C.	1st Edition, McGraw Hill Education, 1987
7	Marketing	Etzel M.J., Walker B.J., Stanton W.J. and Pandit A.	14th Edition, McGraw Hill Education (India), 2010
8	Super Marketwala: Secrets to Winning Consumer India	Mall D.	1st Edition, Random House India, 2014

Branch: Computer Science and Engineering

Course Code	HSM 406
Course Title	**HUMAN RESOURCE MANAGEMENT**
Type of Course	Elective
L T P	2 1 0
Credits	3
Course Assessment Methods	
End Semester Assessment (University Exam.)	50
Continuous Assessment (Sessional, Assignments, Quiz)	50
Course Prerequisites	None
Course Objectives (CO)	1. The main aim of this course is to provide an overview of HRM, keeping the Indian business scenario in the background and to acquaint the students with the strategic role of HRM in managing an organization.
Course Outcome	1. The students will develop the ability to solve problems in area of HRM in organizations. 2. The students will become aware of latest developments in HRM practices which are essential for effective management in organization.

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A
Introduction to Human Resource Management
HRM: Nature, Scope, Functions, HRM Practices and Problems in India with Case Studies

(4 hours)

Human Resource Planning (HRP)
Concept and Process of HRP, Factors Affecting HRP

(3 hours)

Job Analysis and Designing
Uses and Process of Job Analysis, Job Description and Job Specification: Features and Hypothetical Formulation, Job Designing: Job Enrichment, Job Enlargement

(3 hours)

Recruitment and Selection
Recruitment: Sources and Methods
Selection: Selection Process, Selection Tests, Types and Nature of Interviews
Role Playing and Case Study on Selection Process, Tests and Interview

(4 hours)

SECTION-B
Induction and Internal Mobility
Induction Programme, Need and Scope of Internal Mobility: Transfer, Promotion, Demotion

(3 hours)

Training and Development

Training: Need and Methods, Management Development: Need, Methods and Management Development Programme

HRM Games for Development of Employees

(4 hours)

Performance Appraisal and Compensation

Nature and Methods of Performance Appraisal, Hypothetical Performance Appraisal

Compensation: Financial and Non-Financial Benefits

(4 hours)

Employee Health and Safety

Concept, Issues related to Health and Safety, Workplace Health Hazards

(3 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Human Resource Management: Text and Cases	Rao V.S.P.	Excel Books, 2002
2	Human Resource Management	Dessler G. and Varkkey B.	12th Edition, Pearson India, 2011
3	Human Resource Management: Text and Cases	Aswathappa K.	7th Edition, McGraw Hill Education (India), 2013
4	Human Resource Management: Text and Cases	Gupta C.B.	14th Edition, Sultan Chand and Sons, 2012
5	Human Resource Management: Text and Cases	Bedi S.P.S. and Ghai R.K	Bharti Publications, 2012
6	Human Resource Management Applications: Cases, Exercises, Incidents and Skill Builders	Fottler M.D., McAfee R.B. and Nkomo S.M.	7th Edition, Cengage Learning, 2013

Branch: Computer Science and Engineering

Course Code	CS 801
Course Title	**NETWORK SCIENCE: STRUCTURAL ANALYSIS AND VISUALIZATION**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Structures (CS 301), Analysis and Design of Algorithms (CS 401)
Course Objectives (CO)	1. Introduces the Network Science Fundamentals 2. Learn various Network related measures and analysis 3. Introduce Epidemic models and their relation to large networks 4. Learn Contagion spread over the social networks
Course Outcome	1. Understand Fundamentals necessary for Network Science 2. Applications of Network Science in Link Analysis and Prediction 3. Applications of Network Science in understanding and modeling social phenomena 4. Applications of Network Science in understanding and modeling diffusion on networks under various epidemiological models.

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A

Introduction to graph theory and network science: Review of Graph theory and Notations, Introduction to the complex network theory, Network properties and metrics; Power laws:Power law distribution, Scale-free networks, Pareto distribution, normalization, moments. Zipf law, Rank-frequency plot.

(5 hours)

Random graphs: Erdos-Reni random graph model. Poisson and Bernoulli distributions, Distribution of node degrees, Phase transition, gigantic connected component. Diameter and cluster coefficient.Configuration model.

(5 hours)

Centrality measures: Node centrality metrics, degree centrality, closeness centrality, betweenness centrality, eigenvector centrality. Katz status index and Bonacich centrality, alpha centrality Spearman rho and Kendall-Tau ranking distance.

(5 hours)

Link analysis and Prediction: Directed graphs. PageRank, Perron-Frobenius theorem and algorithm convergence.Power iterations.Hubs and Authorities.HITS algorithm. Link prediction problem, Proximity measures, Scoring algorithms, Prediction by supervised learning, Performance evaluation

(10 hours)

SECTION-B

Diffusion on networks: Random walks on graph, Stationary distribution, Physical diffusion, Diffusion equation, Diffusion on networks, Discrete Laplace operator, Laplace matrix, Solution of the diffusion equation, Normalized Laplacian.

(5 hours)

Epidemics: Epidemic models: SI, SIS, SIR, Limiting cases, Basic reproduction number, Branching Galton-Watson process, Probability of epidemics**.** Spread of epidemics on network, SI, SIS, SIR models, Epidemic threshold, Simulations of infection propagation.

(10 hours)

Social contagion and spread of information: Information diffusion. Rumor spreading models.Homogenous and mean field models.Examples.Cascades and information propagation trees.

(3 hours)

Diffusion of innovation and influence maximization: Diffusion of innovation, Independent cascade model, Linear threshold model, Influence maximization, Sub-modular functions. Finding most influential nodes in networks.

(2 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Networks: An Introduction	Mark Newman	Oxford University Press, 2010
2	Social and Economic Networks	Matthew O. Jackson	Princeton University Press, 2010
RECOMMENDED BOOKS			
1	Networks, Crowds, and Markets: Reasoning About a Highly Connected World.	David Easley and John Kleinberg	Cambridge University Press, 2010
2	Social Network Analysis. Methods and Applications.	Stanley Wasserman and Katherine Faust	Cambridge University Press, 2010
3	The Structure and Dynamics of Networks	Eds.M. Newman, A.-L. Barabasi, D. Watts	Princeton University Press, 2006
4	Network Analysis	Eds. UlrikBrandes, Thomas Erlebach	Lecture Notes in Computer Science, Springer, 2005
5	Social Network Data Analysis	Ed. Charu C. Aggarwal	Springer, 2011

Course Code	CS 851
Course Title	**NETWORK SCIENCE: STRUCTURAL ANALYSIS AND VISUALIZATION (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	50

SYLLABUS

Practical based on Network Science: Structural Analysis and Visualization syllabus.

Branch: Computer Science and Engineering

Course Code	CS 802A
Course Title	BUILDING ENTERPRISE APPLICATIONS
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Database Systems (CS 302)
Course Objectives (CO)	1. To introduce the concepts of Enterprise applications and different issues related to their implementation 2. To introduces the architecture of different Enterprise applications and different design modeling techniques for construction. 3. To introduce the different testing techniques for Enterprise application and methodologies used to roll out these applications.
Course Outcome	1. Understand fundamental of Enterprise applications and key determinants to measure the success. 2. Demonstrate an understanding of different modelling techniques used to design Enterprise applications. 3. Construct applications by understanding the design. 4. Test and roll out the enterprise applications in real environment.

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A

Introduction to Enterprise application
Introduction to enterprise applications and their types, software engineering methodologies, life cycle of raising an enterprise application, introduction to skills required to build an enterprise application, key determinants of successful enterprise applications, and measuring the success of enterprise applications.

(8 hours)

Incepting enterprise application and business process modelling
Inception of enterprise applications, enterprise analysis, business modelling, requirements elicitation, use case modelling, prototyping, non functional requirements, requirements validation, planning and estimation.

Enterprise Architecture and designing enterprise application

Concept of architecture, views and viewpoints, enterprise architecture, logical architecture, technical architecture - design, different technical layers, best practices, data architecture and design – relational, XML, and other structured data representations, Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of application architecture and design.

(8 hours)

SECTION-B

Constructing enterprise application

Construction readiness of enterprise applications - defining a construction plan, defining a package structure, setting up a configuration management plan, setting up a development environment, introduction to the concept of Software Construction Maps, construction of technical solutions layers, methodologies of code review, static code analysis, build and testing, dynamic code analysis – code profiling and code coverage.

(12 hours)

Testing and rolling out enterprise application

Types and methods of testing an enterprise application, testing levels and approaches, testing environments, integration testing, performance testing, penetration testing, usability testing, globalization testing and interface testing, user acceptance testing, rolling out an enterprise application.

(10 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Raising Enterprise Applications	Anubhav Pradhan, Satheesha B. Nanjappa, Senthil K. Nallasamy, VeerakumarEsakimuthu	1st edition, Wiley India, 2012
2	Building Java Enterprise Applications,	Brett McLaughlin	Latest edition, O' Reily Media, 2010
3	Software Requirements: Styles & Techniques.	Soren Lauesen	Latest edition, Addison Wesley, 2012
4	Software Systems Requirements Engineering: In Practice	Brian Berenbach, Daniel J. Paulish, Juergen Kazmeier, Arnold Rudorfer	Latest edition, McGraw-Hill/Osborne Media, 2009
5	Managing Software Requirements: A Use Case Approach,	Dean Leffingwell, Don Widrig	1st edition, Pearson, 2003
6	Software Architecture: A Case Based Approach	VasudevVerma	1st edition, Pearson, 2009
7	SOFTWARE TESTING Principles and Practices,	Srinivasan Desikan, Gopalaswamy Ramesh	1st edition, Pearson, 2006

Branch: Computer Science and Engineering

Course Code	CS 852A
Course Title	**BUILDING ENTERPRISE APPLICATIONS (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	50

SYLLABUS

Practical based on Building Enterprise Applications syllabus.

Branch: Computer Science and Engineering

Course Code	CS 802B
Course Title	EXPERT SYSTEMS
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Artificial Intelligence (CS 503); Soft Computing (CS 605B)
Course Objectives (CO)	1. To provide a thorough foundation in the discipline of Artificial Intelligence, focusing on Expert Systems, and related methodologies; to bring current trends and advances in the discipline to the forefront so that they may be considered for possible use as solutions to appropriate problems.
Course Outcome	1. To to bring current trends and advances in the discipline to the forefront so that they may be considered for possible use as solutions to appropriate problems.

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A

Concepts and challenges; Various paradigms in expert systems; Rule-based systems; Bayesian networks

(6 hours)

Knowledge representation and methods of inference

(8 hours)

Probability in AI; Probability and conditional probability; Independence; Bayesian rules; Bayesian views (in comparison with frequentism and propensity interpretation); Utility theories and decision making

(13 hours)

SECTION-B

Bayesian Networks
Inference in Bayesian Networks; Junction Tree Algorithms; Learning in Bayesian Networks

(8 hours)

Decision Networks
Knowledge Engineering with Bayesian Network; Applications of Bayesian Networks; Other formalisms of uncertainty reasoning: Default logic; Certainty factor; Dempster-Shafer theory; Fuzzy set

(10 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Bayesian Artificial Intelligence	Kevin B. Korb and Ann E. Nicholson, Chapman and Hall	CRC Press, 2004
RECOMMENDED BOOKS			
1	Expert Systems: Principles and Programming	Joseph C. Giarratano, Gary D. Riley	4th edition, Thomson Course Technology
2	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	3rd edition, Prentice Hall
3	Bayesian Networks and Decision Graphs	Finn B. Jensen, Thomas Graven-Nielsen	2nd edition, Springer

Branch: Computer Science and Engineering

Course Code	CS 852B
Course Title	**EXPERT SYSTEMS (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	50

SYLLABUS

Practical based on Expert Systems syllabus.

Branch: Computer Science and Engineering

Course Code	CS 802C
Course Title	MACHINE LEARNING AND COMPUTATIONAL INTELLIGENCE
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	50 50
Course Prerequisites	None
Course Objectives (CO)	1. This course is designed to introduce students to the fundamental concepts and ideas in Machine Learning and Computational Intelligence, and to get them up to speed with the current research in the area.
Course Outcome	1. Understand the problems that can be solved with machine learning 2. Understand the fundamental concepts of different machine learning techniques 3. Apply machine learning to solve real-world problems

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A
INTRODUCTION TO MACHINE LEARNING
Examples of Machine Learning Problems, Structure of Learning, Learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models: Geometric Models, Logical Models, Probabilistic Models. Features: Feature types, Feature Construction and Transformation, Feature Selection.

(8 hours)

CLASSIFICATION AND REGRESSION
Classification: Binary Classification- Assessing Classification performance, Class probability Estimation- Assessing class probability Estimates, Multiclass Classification.
Regression: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression.
Theory of Generalization: Effective number of hypothesis, Bounding the Growth function, VC Dimensions, Regularization theory

(8 hours)

LINEAR MODELS
Least Squares method, Multivariate Linear Regression, Regularized Regression, Using Least Square regression for Classification. Perceptron, Support Vector Machines, Soft Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non-Linearity.

SECTION-B

LOGIC BASED AND ALGEBRAIC MODELS

Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering,

Rule Based Models: Rule learning for subgroup discovery, Association rule mining.

Tree Based Models: Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees.

(7 hours)

PROBABILISTIC MODELS

Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier, Discriminative learning with Maximum likelihood, Probabilistic Models with Hidden variables: Estimation-Maximization Methods, Gaussian Mixtures, and Compression based Models.

(7 hours)

TRENDS IN MACHINE LEARNING

Model and Symbols- Bagging and Boosting, Multitask learning, Online learning and Sequence Prediction, Data Streams and Active Learning, Deep Learning, Reinforcement Learning.

(8 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Introduction to Machine Learning	EthemAlpaydin	PHI, 2013
2	Machine Learning: The Art and Science of Algorithms that Make Sense of Data	Peter Flach	Cambridge University Press, 2012
RECOMMENDED BOOKS			
1	Introduction to Statistical Machine Learning with Applications in R	Hastie, Tibshirani, Friedman	Springer, 2012
2	Reinforcement and Systematic Machine Learning for Decision Making	Parag Kulkarni	Wiley-IEEE Press, 2012

Branch: Computer Science and Engineering

Course Code	CS 852C
Course Title	**MACHINE LEARNING AND COMPUTATIONAL INTELLIGENCE (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	50

SYLLABUS

Practical based on Machine Learning and Computational Intelligence syllabus.

Branch: Computer Science and Engineering

Course Code	CS 802D
Course Title	**DISTRIBUTED COMPUTING**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Operating Systems (CS 403), Data Communication and Networks (CS 501)
Course Objectives (CO)	1. To introduce distributed systems, their architecture, types and enabling technologies. 2. To make them understand how communication takes place in a distributed environment. 3. To introduce issues related to process execution, naming and security in distributed systems. 4. To make them understand distributed systems by studying existing systems. 5. To make them familiar with the design and implementation issues of distributed systems.
Course Outcome	1. Differentiate between a distributed and a network system and understand how communication takes place in a distributed environment. 2. Understand how process execution in distributed systems is different from process execution in non-distributed systems and the design and implement issues of a name space. 3. Identify security risks and their handling mechanisms in distributed environment. 4. Understand and design distributed object based systems, distributed file based systems and web based systems.

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A

Introduction to Distributed Systems

Definition of distributed systems, their objectives, types, architecture, self management in distributed systems, introduction to XML, SOAP, service oriented architecture.

(6 hours)

Communication

Interprocess communication, Remote Procedure Call (RPC), Remote Method Invocation (RMI), Remote Object Invocation, Message Oriented Communication.

(6 hours)

Processes

Introduction to threads, threads in distributed and non distributed systems, virtualization, networked user interfaces, client side software, design issues for servers, code migration.

(6 hours)

Naming

General issues with respect to naming, flat naming, distributed hash tables, hierarchical approaches, structured naming, name spaces, name resolution, implementation of a name space, domain name system, X.500 name space, attribute based naming.

(5 hours)

SECTION-B

Security

Security threats, policies, and mechanisms, design issues, cryptography, secure channels, authentication using public key cryptography, message integrity and confidentiality, digital signatures, session keys, Kerberos, general issues in access control, firewalls.

(6 hours)

Distributed Object-based Systems

Distributed objects, general architecture of an EJB server, global distributed shared objects, processes, object servers, communication, static vs. dynamic RMI, Java RMI, naming, CORBA object references.

(6 hours)

Distributed File Systems

Architecture: client-server, cluster-based distributed file systems, symmetric architectures, communication, RPC in NFS, naming, Naming in NFS, synchronization, consistency and replication.

(5 hours)

Distributed Web-based Systems

Architecture, traditional web-based systems, web services, processes, general organization of the Apache web server, web server clusters, communication, hypertext transfer protocol, simple object access protocol, naming, replication for web hosting systems.

(5 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Distributed Systems- Principles and Paradigms	Andrew S. Tanenbaum	2nd edition, Pearson Education
2	Distributed Systems – Concepts and Design	George Coulouris, Jean Dollimore, Tim Kindberg	4th edition, Pearson Education
3	Distributed Systems and Networks	William Buchanan	McGraw-Hill

Branch: Computer Science and Engineering

Course Code	**CS 852D**
Course Title	**DISTRIBUTED COMPUTING (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical based on Distributed Computing syllabus.

Branch: Computer Science and Engineering

Course Code	CS 802E
Course Title	**PATTERN RECOGNITION**
Type of Course	Elective
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	50 50
Course Prerequisites	None
Course Objectives (CO)	1. This course is designed to introduce students to the fundamental concepts and ideas in Pattern Recognition, and to get them up to speed with the current research in the area.
Course Outcome	1. Understand the problems that can be solved with the application of principles of Pattern Recognition 2. Understand the fundamental theory of different pattern recognition techniques 3. Apply pattern recognition techniques to solve problems

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A

INTRODUCTION - Basic concepts, Applications, Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Examples of Automatic Pattern recognition systems, Simple pattern recognition model

(4 hours)

DECISION AND DISTANCE FUNCTIONS - Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

(5 hours)

STATISTICAL DECISION MAKING - Introduction, Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

(7 hours)

NON PARAMETRIC DECISION MAKING - Introduction, histogram, kernel and window estimation, nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminate functions, Minimum squared error discriminate functions, choosing a decision making techniques.

(6 hours)

CLUSTERING AND PARTITIONING - Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.

(6 hours)

PATTERN PREPROCESSING AND FEATURE SELECTION- Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

(7 hours)

SYNTACTIC PATTERN RECOGNITION - Introduction, concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers

(7 hours)

APPLICATION OF PATTERN RECOGNITION - Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scan, Finger prints recognition, etc.

(3 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Pattern Recognition and Image Analysis	Earl Gose, Richard johnsonbaugh, Steve Jost	Prentice Hall of India,.Pvt Ltd, New Delhi, 1996
2	Pattern Classification	Duda R.O., P.E.Hart& D.G Stork	2nd edition, J.WileyInc, 2001
RECOMMENDED BOOKS			
1	Pattern Recognition: Statistical Structural and Neural Approaches	Robert Schalkoff	John wiley& sons , Inc, 1992
2	Neural Networks for Pattern Recognition	Bishop C.M	Oxford University Press, 1995

Branch: Computer Science and Engineering

Course Code	CS 852E
Course Title	**PATTERN RECOGNITION (Practical)**
Type of Course	Elective
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	50

SYLLABUS

Practical based on Pattern Recognition syllabus.

Branch: Computer Science and Engineering

Course Code	CS 803A
Course Title	SOFTWARE AGENTS
Type of Course	Elective
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Artificial Intelligence (CS 503); Soft Computing (CS 605B)
Course Objectives (CO)	1. To introduce the concept of agents, their design and manipulation. 2. To study the various aspects related to agent architecture and communication.
Course Outcome	1. To understand the concept of agents, their architecture. 2. To understand agent communication and their role in information sharing. 3. To be able to apply the knowledge gained to implement a software agent.

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A
AGENT AND USER EXPERIENCE
Interacting with Agents - Agent From Direct Manipulation to Delegation - Interface Agent Metaphor with Character - Designing Agents - Direct Manipulation versus Agent Path to Predictable.

(9 hours)

AGENTS FOR LEARNING IN INTELLIGENT ASSISTANCE
Agents for Information Sharing and Coordination - Agents that Reduce Work Information Overhead - Agents without Programming Language - Life like Computer character - S/W Agents for cooperative Learning - Architecture of Intelligent Agents

(9 hours)

SECTION-B
AGENT COMMUNICATION AND COLLABORATION
Overview of Agent Oriented Programming - Agent Communication Language - Agent Based Framework of Interoperability

(9 hours)

AGENT ARCHITECTURE
Agents for Information Gathering - Open Agent Architecture - Communicative Action for Artificial Agent

(9 hours)

MOBILE AGENTS

Mobile Agent Paradigm - Mobile Agent Concepts -Mobile Agent Technology - Case Study: Tele Script, Agent Tel

(9 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Software Agents	Jeffrey M.Bradshaw	MIT Press, 2000.
2	Mobile Agents	William R. Cockayne, Michael Zyda	Prentice Hall, 1998.
RECOMMENDED BOOKS			
1	Artificial Intelligence: A Modern Approach	Russel &Norvig	2nd edition, Prentice Hall, 2002.
2	Constructing Intelligent agents with Java: A Programmer's Guide to Smarter Applications	Joseph P.Bigus& Jennifer Bigus	Wiley, 1997.

Branch: Computer Science and Engineering

Course Code	CS 803B
Course Title	**HUMAN COMPUTER INTERACTION**
Type of Course	Elective
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. To recognize and recall terminology, facts and principles. 2. To determine the relationships between specific instances and broader generalizations. 3. To use concepts and principles to explain, analyze and solve specific situations, often with the applicable concepts implicit in the setting. 4. To apply course content in coping with real life situations. These differ from directed applications by having less structured questions and issues, no direction as to which concepts will be applicable and a range of potentially acceptable answers.
Course Outcome	1. To understand the basics of human and computational abilities and limitations. 2. To understand basic theories, tools and techniques in HCI. 3. To understand the fundamental aspects of designing and evaluating interfaces. 4. To practice a variety of simple methods for evaluating the quality of a user interface. 5. To apply appropriate HCI techniques to design systems that are usable by people.

SYLLABUS

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

SECTION-A

Introduction to Human-Computer Interaction.Psychology of everyday things: psychopathology ofeveryday things, examples, concepts for designing everyday things

(3 hours)

User-centred design and prototyping: assumptions, participatory design, methods for involving the user, prototyping, low fidelity prototypes, medium fidelityprototypes, wizard of Oz examples

(5 hours)

Task-centred system design: task-centered process, development of task examples, evaluation of designs through a task-centered walk-through

(5 hours)

Methods for evaluation of interfaces with users: goals of evaluation, approaches, ethics, introspection, extracting the conceptual model, direct observation, constructive interaction, interviews and questionnaires, continuous evaluation via user feedback and field studies, choosing an evaluation method.

(10 hours)

SECTION-B

Beyond screen design: characteristics of good representations, information visualization, Tufte's guidelines, visual variables, metaphors, direct manipulation. Graphical screen design: graphical design concepts, components of visible language, graphical design by grids

(10 hours)

Design principles and usability heuristics: design principles, principles to support usability, golden rules and heuristics, HCI patterns. HCI design standards: process-oriented standards, product-oriented standards, strengths and limitations of HCI Standards

(10 hours)

Past and future of HCI: the past, present and future, perceptual interfaces, context-awareness and perception

(2 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	Human-Computer Interaction	Dix A. et al.	Harlow, England: Prentice Hall, 2004.
RECOMMENDED BOOKS			
1	Interaction Design: Beyond Human Computer Interaction	Yvonne Rogers, Helen Sharp, Jenny Preece	3rd Edition, Wiley, 2011

Branch: Computer Science and Engineering

Course Code	CS 803C
Course Title	**INFORMATION RETRIEVAL AND MANAGEMENT**
Type of Course	Elective
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Artificial Intelligence (CS 503), Soft Computing (CS 605B), Data Mining and Analysis (CS 605C)
Course Objectives (CO)	1. This subject will provide the knowledge of various concepts involved in efficient information retrieval that leads to the development of efficient Web crawling techniques.
Course Outcome	1. Understand fundamental of Information Retrieval systems 2. Understand the indexing mechanism and their application in text based retrieval systems. 3. Understand the web search engine basics and different methods to design this. 4. Compare and contrast various web search engines using different types of queries.

SYLLABUS

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SECTION-A

Introduction
Introduction to Information Retrieval. Inverted indices and boolean queries. Query optimization. The nature of unstructured and semi-structured text.

(5 hours)

The term vocabulary and postings lists
Text encoding: tokenization, stemming, lemmatization, stop words, phrases. Optimizing indices with skip lists. Proximity and phrase queries.Positional indices.

(5 hours)

Dictionaries and tolerant retrieval
Dictionary data structures. Wild-card queries, permuterm indices, n-gram indices. Spelling correction and synonyms: edit distance, soundex, language detection.

(6 hours)

Index construction

Postings size estimation, sort-based indexing, dynamic indexing, positional indexes, n-gram indexes, distributed indexing, real-world issues.

(5 hours)

SECTION-B

Scoring

Term weighting and the vector space model.Parametric or fielded search.Document zones.The vector space retrieval model.weighting. The cosine measure.Scoring documents.

(6 hours)

Computing scores in a complete search system

Components of an IR system.Efficient vector space scoring.Nearest neighbor techniques, reduced dimensionality approximations, random projection.

(6 hours)

Classification

Naive Bayes models. Spam filtering, K Nearest Neighbors, Decision Trees, Support vector machine classifiers.

(6 hours)

Web Crawling

What makes the web different? Web search overview, web structure, the user, paid placement, search engine optimization. Web size measurement, Crawling and web indexes. Near-duplicate detection, Link analysis, Learning to rank, focused web crawler and its different architectures.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Introduction to Information Retrieval	C. Manning, P. Raghavan, and H. Schütze	Cambridge University Press, 2008
2	Modern Information Retrieval	R. Baeza-Yates, B. Ribeiro-Neto	Addison-Wesley, 1999

Branch: Computer Science and Engineering

Course Code	CS 803D
Course Title	**CRYPTOGRAPHY AND NETWORK SECURITY**
Type of Course	Elective
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Data Communication and Networks (CS 501)
Course Objectives (CO)	The subject Information Security aims at providing essential concepts and methods for providing and evaluating security in information processing systems (operating systems and applications, networks, protocols, and so on). In addition to its technical content, the course touches on the importance of following: 1. Develop a "security mindset:" learn how to critically analyze situations of computer and network usage from a security perspective, identifying the salient issues, viewpoints, and trade-offs. 2. To understand basic Encryption and Decryption Algorithms, security threats, challenges in Information Security 3. Have understanding of security management which describes access control, secure group management and authorization management. 4. Familiarization with working of various Key management protocols 5. To learn how to provide security in Networks and Web 6. To understand various working and installation of Firewalls
Course Outcome	1. Understand data encryption and decryption techniques (such as caesar Cipher, Monoalphabetic ciphers, Polyalphabetic Ciphers such as Vigenere, Vernam Cipher etc.) 2. Apply these techniques on given data by using various softwares like:- RSA Cryptosystem, Proxy Crypt, Packet Tracer, WireShark etc. 3. Understand methods which authenticates and secure the messages. 4. Contribute towards network security and web security.

SYLLABUS

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SECTION-A

Basic Encryption and Decryption:
Attackers and Types of threats, challenges for information security, Encryption Techniques, Classical Cryptographic
Algorithms: Monoalphabetic Substitutions such as the Caesar Cipher, Cryptanalysis of Monoalphabetic ciphers, Polyalphabetic Ciphers such as Vigenere, Vernam Cipher.

(6 hours)

Stream, Block, Symmetric Key and Asymmetric Key Ciphers:
Rotor based system and shift register based systems. Block cipher: principles, modes of operations. The Data encryption Standard (DES), Analyzing and Strengthening of DES, Introduction to Advance Encryption Standard (AES), Concept and Characteristics of Public Key Encryption system, Rivets – Shamir-Adlman (RSA) Encryption, Digital Signature Algorithms and authentication protocols, The Digital Signature Standard (DSA).

(7 hours)

Number theory and basic Algebra: Modular Arithmetic, Euclidean algorithm, Random number generation

(5 hours)

Key Management Protocols: Solving Key Distribution Problem, Diffie-Hellman Algorithm, Key Exchange with Public Key Cryptography.

(6 hours)

SECTION-B

Message Authentication and Hash Functions
Authentication Requirements, Authentication Functions, Message Authentication codes, Hash Functions, Hash Algorithms (MD-5 and SHA-1), Key Management Algorithms.

(5 hours)

Network Security: Kerberos, IP security: Architecture, Authentication Header, Encapsulating Security Payload, Digital Signatures and Digital Signature Standards.

(5 hours)

Web Security: Web security consideration, secure socket Layer protocol, Transport Layer Security Secure Electronic Transaction Protocol.

(6 hours)

Firewalls: Firewall Design principles, Characteristics, Types of Firewall, trusted systems, Virtual Private Networks.

(5 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	Network Security Essentials, Applications and Standards	William Stallings	Pearson Education.38
RECOMMENDED BOOKS			
1	Cryptography and Network Security Principles and practice	William Stallings	Pearson Education.
2	Introduction to Computer Security. Addison-Wesley	Bishop, Matt	Pearson Education, Inc./ ISBN: 0-321-

			24744-2, 2005
3	Principles of Information Security	Michael. E. Whitman and Herbert J. Mattord	
4	Cryptography & Network Security, TMH,	AtulKahate	2nd Edition

Branch: Computer Science and Engineering

Course Code	CS 803E
Course Title	**ADVANCE IMAGE PROCESSING**
Type of Course	Elective
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	50 50
Course Prerequisites	Digital Image Processing (CS 701)
Course Objectives (CO)	1. This course include ideas and theory behind the state-of-the art techniques used in the area of image processing, and is designed for the students who have already undergone a basic course on digital image processing.
Course Outcome	1. Understand the image fundamentals and mathematical transforms necessary for image processing 2. Understand how images are analyzed to extract features of interest 3. Understand concept of image registration and image fusion 4. Analyze and solve domain specific research problems using image processing

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A
FUNDAMENTALS OF DIGITAL IMAGE PROCESSING
Elements of visual perception, brightness, contrast, hue, saturation, 2D image transforms-DFT, DCT. Image enhancement in spatial and frequency domain, Review of morphological image processing

(6 hours)

SEGMENTATION
Region growing, Fuzzy clustering, Watershed algorithm, Active contour methods, Active Shape Models, Active Appearance Models, Texture feature based segmentation, Atlas based segmentation, Wavelet based Segmentation methods

(10 hours)

FEATURE EXTRACTION
Phase congruency, Localized feature extraction- detecting image curvature, shape features Hough transform, shape skeletonization, Boundary descriptors, Moments, Texture descriptors- Autocorrelation, Co-occurrence features, Run-length features, Fractal model based features, Gabor filter, wavelet features, Scale Invariant Feature Transform (SIFT), Speeded Up Robust Features (SURF)

(10 hours)

REGISTRATION AND IMAGE FUSION

Registration- Preprocessing, Feature selection-points, lines, regions and templates Feature correspondence-Point pattern matching, Line matching, region matching Template matching. Transformation functions-Similarity transformation and Affine Transformation. Resampling- Nearest Neighbour and Cubic Splines Image Fusion-Overview of image fusion, pixel fusion, Multi-resolution based fusion discrete wavelet transform, Curvelet transform. Region based fusion.

(10 hours)

3D IMAGE VISUALIZATION

Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Surfaces, Multiply connected surfaces, Image processing in 3D, Measurements on 3D images

(9 hours)

TEXT BOOKS			
S. No.	NAME	AUTHOR(S)	PUBLISHER
1	The Image Processing Handbook	John C.Russ	CRC Press, 2007
2	Feature Extraction and Image Processing	Mark Nixon, Alberto Aguado	Academic Press, 2008
RECOMMENDED BOOKS			
1	Computer Vision: A Modern Approach	David A. Forsyth and Jean Ponce	Pearson Education, 2003
2	Computer Vision: Algorithms and Applications	Richard Szelisk	Springer, 2010