Paper Name: Information Retrieval
Code: PEC-CS801D
Credit: 3
Professional Elective I

Course Outcome:

1. Students will be able to remember the concepts of Information Retrieval architecture with the essence of different models.

2. Students will be able to understand the concepts of Tokenizing, Indexing.

3. Students will be able to apply the different concepts of Web Search and Categorization with different experimental evaluations.

4. Students will be able to analyse the process of Clustering and Language Model based translation techniques.

5. Students will be able to evaluate different recommender systems as well as different information extraction processes and question answering systems.

6. Students will be able to create one intelligent and personalized IR system with different Machine and Deep Learning techniques.

Detailed Syllabus: Module No.	**Content**	**Hrs./Module**
1	**Introduction:** Goals and history of IR. The impact of the web on IR. **Basic IR Models**: Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity.	**5**
2	**Basic Tokenizing, Indexing, and Implementation of Vector-Space Retrieval**: Simple tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors; Java implementation. **Experimental Evaluation of IR**: Performance metrics: recall, precision, F-measure, and NDCG; Evaluations on benchmark text collections.	**6**

3	**Query Operations**: Relevance feedback; Query expansion. **Text Representation**: Word statistics; Zipf's law; Porter stemmer; morphology; index term selection; using thesauri. **Web Search**: Search engines; spidering; meta crawlers; directed spidering; link analysis (e.g. hubs and authorities, Google PageRank); shopping agents.	**8**
4	**Text Categorization**: Categorization algorithms: Rocchio, nearest neighbour, and naive Bayes. Applications to information filtering and organization. **Text Clustering**: Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM).	**8**

Text Books and Reference Books:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press. 2008.

2. Cheng Xiang Zhai, Statistical Language Models for Information Retrieval (Synthesis Lectures Series on Human Language Technologies), Morgan & Claypool Publishers, 2008.

Paper Name: Data Science
Code: PEC-CS801E
Credit: 3
PRE-REQUISITES

Introduction to Programming

Probability

OBJECTIVES

The objective of this course is to impart necessary knowledge of the mathematical foundations needed for data science and develop programming skills required to build data science applications.

LEARNING OUTCOMES

At end of this course, the students will be able to:

Demonstrate understanding of the mathematical foundations needed for data science.

Collect, explore, clean, munge and manipulate data.

Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering.

Build data science applications using Python based toolkits.

DETAIL CONTENTS

1. Introduction to Data Science (4 Hours)

Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting

2. Introduction to Programming Tools for Data Science (6 Hours)

2.1 Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK

2.2 Visualizing Data: Bar Charts, Line Charts, Scatterplots

2.3 Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using

the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling,

Dimensionality Reduction 3. Mathematical Foundations (12 Hours)

3.1 Linear Algebra: Vectors, Matrices,

3.2 Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox,

Correlation and Causation

3.3 Probability: Dependence and Independence, Conditional Probability, Bayes's

Theorem, Random Variables, Continuous Distributions, The Normal Distribution,

The Central Limit Theorem

3.4 Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, Phacking, Bayesian Inference

4. Machine Learning (16 Hours)

Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine

learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear

Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and

Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector

machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time

Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural NetworksLearning And Generalization,

Overview of Deep Learning.

5. Case Studies of Data Science Application (6 Hours)

Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

LIST OF PRACTICALS

1. Write a programme in Python to predict the class of the flower based on available attributes.

2. Write a programme in Python to predict if a loan will get approved or not.

3. Write a programme in Python to predict the traffic on a new mode of transport.

4. Write a programme in Python to predict the class of user.

5. Write a programme in Python to indentify the tweets which are hate tweets and which are not.

6. Write a programme in Python to predict the age of the actors.

7. Mini project to predict the time taken to solve a problem given the current status of the user

LIST OF SUGGESTED BOOKS

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media

2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media

3. Jain V.K., “Data Sciences”, Khanna Publishing House, Delhi.

4. Jain V.K., “Big Data and Hadoop”, Khanna Publishing House, Delhi.

5. Jeeva Jose, “Machine Learning”, Khanna Publishing House, Delhi.

6. Chopra Rajiv, “Machine Learning”, Khanna Publishing House, Delhi.

7. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press http://www.deeplearningbook.org

8. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

Paper Name: Human Resource Development and Organizational Development
Code: OEC-CS801D
Credit: 3
Course:

Module 1-Human Resource Management: Meaning & Definition, Functions, Scope & Objectives, Qualities of a HR Manager

Module 2- Human Resource Planning: Meaning & Definition, Importance of HRP, HRP Process. Barriers of HRP, Factors of sound HRP. Recruitment – Meaning & Definition, Sources of Recruitment, Recruitment Process, Effective Recruitment. Training & Performance Appraisal-Definition & Objective, Areas of Training, Meaning & Definition of Performance Appraisal, process, Effective principles of performance Appraisal.

Module 3- Industrial Relations: Concept & Meaning, Objective & Importance, Reasons of poor Industrial Relation. Industrial Disputes- Meaning & Definition, Causes of Industrial Dispute, Prevention of Industrial Dispute, Conditions for good Industrial Relation.

Module 4- Workers Participation in Management: Meaning & Need, Forms of Participation, Scheme of participation, Merits & Demerits. Collective Bargain- Meaning & Definition, Objective & Importance, Process of Collective Bargain, Effective Condition. Employee Discipline-Guidelines for action, Penalties & Punishment, Rewards of Discipline.

Text Books:

1. Human Resource Management. P. Subba Rao, Himalaya Publishing House, 2012.

2. Human Resource Management. K.Aswathappa. Mc GRAW HILL Education, 2013.

Reference Books:

1. Human Resource Development Management. A. M.Seikh S.Chand, 2003.

2. Human Resource Management. S.S.Khanka, S. Chand, 2014.

Course Code : OEC-CS 801E
Course Title : Enterprise System

Credit : 3

[Course Outcomes]

1. Remembering the basic concept of enterprise systems.
2. Understanding different types and components of enterprise systems.

3. Apply that knowledge to understand architectures and the enterprise systems market.
4. Analyse system integration and strategies for implementing and using enterprise systems.
5. Evaluation of trends, opportunities and issues with enterprise systems.
6. Create new concepts to overcome Modern Enterprise system challenges.

Module 1: Fundamentals of enterprise systems, introduces concepts: Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, Business Process Management. Organisational behaviour. [10L]

Module 2: Evolution of enterprise systems and provide a theoretical understanding of enterprise systems in organisation, Enterprise resource planning and utilisation.
[8L]

Module 3: Enterprise Systems implementation and use, enterprise systems implementation life cycle and use in organisations. Case-studies, insight opportunities and challenges of enterprise systems in organisations. hands-on experiences with enterprise systems applications, Communication: Use, advantages and barriers. [8L]

Module 4: Contemporary issues in Enterprise Systems practice, analyse an enterprise systems implementation, Implementation of new tools and technology to overcome challenges, solutions or change measures. [8L]

Module 5: Finance and Accounting concepts, Rate of Return Methods, Break even analysis, Financial statements, basic accounting concept. [10L]

[Books/References]

1. Enterprise Systems for Management, J. Thompson.
2. Design of Enterprise Systems: Theory, Architecture, and Methods, Ronald Giachetti.
3. Enterprise Supply Chain Management, V Sehgal
4. Enterprise Performance Management Done Right: An Operating System for Your Organization, Ron Dimon
5. The Flexible Enterprise (Flexible Systems Management), by Sushil and Edward A. Stohr.

Mobile Computing (OECCS802D)

Contracts: 3L

Credits- 3

Prerequisite:

Computer Network, Data Communication

Course Outcomes:

After completion of this course, student will be able

CO1: To understand concepts of Mobile Communication.

CO2: To understand network and transport layers of Mobile Communication

CO3: Analyse various protocols of all layers for mobile and ad hoc wireless communication networks.

CO4: To understand IP and TCP layers of Mobile Communication.

Module 1: Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signalling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signalling. [5L]

Module 2: General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP. [5L]

Module 3: Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark-up Languages (WML). Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies. [7L]

Module 4: Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G. [7L]

Module 5: Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. [7L]

Module 6: Server-side programming in Java, Pervasive web application architecture, Device independent example application [8L]

Text:

T1. "Pervasive Computing", Burkhardt, Pearson

T2. "Mobile Communication", J. Schiller, Pearson

T3. "Wireless and Mobile Networks Architectures", Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001

T4. "Mobile and Personal Communication systems and services", Raj Pandya, Prentice Hall of India, 2001.

Reference:

R1. "Guide to Designing and Implementing wireless LANs", Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.

R2. "Wireless Web Development", Ray Rischpater, Springer Publishing,

R3. "The Wireless Application Protocol", Sandeep Singhal, Pearson .

R4. "Third Generation Mobile Telecommunication systems", by P. Stavronlakis, Springer Publishers

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Course Code : OEC-CS 802E
Course Title : Real Time Operating System

Credit : 3

Course Outcome

1. Students will be able to remember the concepts of OS, BIOS, BOOT, Threads, Scheduling, Process etc.
2. Students will be able to understand the different RTOS concepts.
3. Students will be able to apply the different RTOS process management concepts.
4. Students will be able to analyse the different IPC concepts.
5. Students will be able to evaluate different memory management aspects.
6. Students will be able to create different segments of RTOS by knowing the different real life case studies.

Detailed Syllabus:

Module No.	Content	Hrs./Module
1	**INTRODUCTION:** Introduction to Operating System: Computer Hardware Organization, BIOS and Boot Process, Multi-threading concepts, Processes, Threads, Scheduling.	10
2	**BASICS OF REAL-TIME CONCEPTS:** Terminology: RTOS concepts and definitions, real-time design issues, examples, Hardware Considerations: logic states, CPU, memory, I/O, Architectures, RTOS building blocks, Real-Time Kernel.	13
3	**PROCESS MANAGEMENT:** Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms Threads: Multi-threading models, threading issues, thread libraries, synchronization Mutex: creating, deleting, prioritizing mutex, mutex internals	13
4	**INTER-PROCESS COMMUNICATION:** Messages, Buffers, mailboxes, queues, semaphores, deadlock, priority	6

	inversion,	
5	**PIPES MEMORY MANAGEMENT:** Process stack management, run-time buffer size, swapping, overlays, block/page management, replacement algorithms, real-time garbage collection	**6**
6	**CASE STUDIES:** Case study Linux POSIX system, RTLinux / RTAI, Windows system, Vxworks, uItron Kernel Design Issues: structure, process states, data structures, inter-task communication mechanism, Linux Scheduling	**12**

Text Books and Reference Books:

1. J. J Labrosse, “MicroC/OS-II: The Real –Time Kernel”, Newnes, 2002.

2. Jane W. S. Liu, “Real-time systems”, Prentice Hall, 2000.

3. W. Richard Stevens, “Advanced Programming in the UNIX® Environment”, 2nd Edition, Pearson Education India, 2011.