5. Stallings W. *Network security essentials Applications and Standards*, 6th edition, Pearson Education, 2018.
6. Whitman M.E., Mattord H.J., *Principle of Information Security*, 6th edition, Cengage Learning, 2017.
7. Bishop M., *Computer Security: Art and Science*, 2nd Revised edition, Pearson Education, 2019.
8. Anderson R.J., *Security Engineering: A guide to building Dependable Distributed Systems*, 2nd edition, John Wiley & Sons, 2008.

Suggested Practical List

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois.
2. Use of Password cracking tools : John the Ripper, Ophcrack. Verify the strength of passwords using these tools.
3. Use nmap/zenmap to analyze a remote machine.
4. Use Burp proxy to capture and modify the message.
5. Implement caesar cipher substitution operation.
6. Implement monoalphabetic and polyalphabetic cipher substitution operation.
7. Implement playfair cipher substitution operation.
8. Implement hill cipher substitution operation.
9. Implement rail fence cipher transposition operation.
10. Implement row transposition cipher transposition operation.
11. Implement product cipher transposition operation.

COMMON POOL OF DISCIPLINE ELECTIVE COURSES (DSE) COURSES

Computer Science Courses for all Undergraduate Programmes of study with Computer Science as Discipline Elective

DISCIPLINE SPECIFIC ELECTIVE COURSE: Information and Image

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
DSE8a: Information and Image Retrieval	**4**	**3**	**0**	**1**	Pass in Class XII	Digital Image Processing

Course Objective

This course introduces students to the fundamentals of information retrieval extending into image retrieval. It lays the theoretical foundation of various essential concepts related to image searches, together with examples of natural and texture image types. It will provide insight to content-based image retrieval, understanding of the technologies, and solutions of content-based image retrieval.

Course Learning Outcomes

On the successful completion of the course, the student would be able to:

1. Understand the concept of information retrieval and the information retrieval models.
2. Understand the working of Text based and content based image retrieval systems.
3. Identify and evaluate the use of content-based features in indexing and retrieval of various types of media content
4. Extract different visual features from images
5. Understand indexing and the semantics of visual data
6. Understand query specification and evaluate the retrieval

Syllabus

Unit 1 Introduction to IR: An example information retrieval problem, the extended Boolean model versus ranked retrieval, The term vocabulary and postings lists: Tokenization, stop words, Normalization (equivalence classing of terms), Stemming and lemmatization, term weighting model: Inverse document frequency, Tf-idf weighting, Information retrieval system evaluation.

Unit 2 CBIR and feature extraction: Image Retrieval: Multimedia Information retrieval , Text Based Image Retrieval (TBIR), Content Based Image Retrieval (CBIR), Hybrid systems. Architecture of a typical CBIR system, Low-level features of an image: Color – color space, color moments, color histogram, color coherence vector (CCV), color correlogram, invariant color features.

Texture – Tamura features, coarseness, contrast, SAR Model, Wavelet transform feature. Shape- Moment invariants, turning angles, Fourier descriptors.

Unit 3 Similarity measures and Performance evaluation: Similarity measures used in content-based image retrieval: Minkowski-form distance, Mahalanobis distance, Canberra distance, Earth Mover distance, Quadratic form distance

Performance evaluation used in content-based image retrieval: user Comparison, precision and recall, P-R graph, Average Precision, F-measure, Average Normalized Modified Retrieval Rank (ANMRR)

Unit 4 CBIR systems: QBIC: Query by Image Content, VIR, VisualSEEK, WebSEEK, NeTRA, MARS: Multimedia Analysis and Retrieval System, SIMPLIcity.

Unit 5 Content-Based Image Retrieval-Challenges: Semantic gap: Introduction to semantic gap. Bridging the semantic gap: Relevance feedback, multi-modal fusion. Semantic similarity: WordNet.

"Curse of Dimensionality": Feature Dimensionality reduction, Methods for dimensionality reduction: Principal Component Analysis (PCA), Fisher Linear Discriminant Analysis (FLDA), Local Fisher Discriminant Analysis (LFDA), Isometric Mapping (ISOMAP), Locally Linear Embedding (LLE), and Locality Preserving Projections (LPP).

References

1. C. Manning, P. Raghavan, and H. Schutze *Introduction to Information Retrieval* Cambridge University Press, 2009 .

2. Vipin Tyagi *Content-Based Image Retrieval: Ideas, Influences, and Current Trends*, Springer, 2018.

Suggested Practical List

To be implemented in Python

1. Write a program to compute the edit distance between strings s1 and s2. (Hint. Levenshtein Distance)
2. Write a program to Compute Similarity between two text documents.
3. Write a program for Pre-processing of a Text Document: stop word removal.
4. Consider 3 documents as below:-

   Doc 1: Ben studies about computers in Computer Lab.
   Doc 2: Steve teaches at Brown University.
   Doc 3: Data Scientists work on large datasets.

   Perform search on these documents with the following query: Data Scientists and, calculate tf * idf for data and Scientists in all the documents.
5. Write a program to find out the similarity between document d1 and d2 (refer question#4) using cosine similarity method.
6. Write a program to calculate the color moments, color histogram, color coherence vector (CCV), color correlogram for an image.
7. Write a program to find out the similarity between two images using:-
   a. Minkowski-form distance
   b. Mahalanobis distance
   c. Canberra distance
   d. Earth Mover distance
   e. Quadratic form distance
8. Given a confusion matrix

		ACTUAL	
		Negative	Positive
PREDICTION	Negative	60	8
	Positive	22	10

Write a program to find precision and recall, Average Precision, F-measure, Average Normalized Modified Retrieval Rank (ANMRR).