Operations Research

Subject Code		
:	**06IS661**	

IA Marks
: 25

No. of Lecture Hours/Week
: 04

Exam Hours
: 03

Total No. of Lecture Hours

: 52

Exam Marks

:100

PART - A

Unit - 1

Introduction, Linear Programming – 1: Introduction: The origin, nature and impact of OR; Defining the problem and gathering data; Formulating a mathematical model; Deriving solutions from the model; Testing the model; Preparing to apply the model; Implementation.

Introduction to Linear Programming: Prototype example; The linear programming (LP) model.

6 Hours

unit - 2

LP – 2, Simplex Method – 1: Assumptions of LP; Additional examples.

The essence of the simplex method; Setting up the simplex method; Algebra of the simplex method; The simplex method in tabular form; Tie breaking in the simplex method.

7 Hours

unit - 3

Simplex Method – 2: Adapting to other model forms; Post optimality analysis; Computer implementation. Foundation of the simplex method.

6 Hours

unit - 4

Simplex Method – 2, Duality Theory: The revised simplex method, a fundamental insight.

The essence of duality theory; Economic interpretation of duality. Primal dual relationship; Adapting to other primal forms.

7 Hours

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PART - B

Unit - 5

Duality Theory and Sensitivity Analysis, Other Algorithms for LP: The role of duality in sensitive analysis; The essence of sensitivity analysis; Applying sensitivity analysis. The dual simplex method; Parametric linear programming; The upper bound technique.

7 Hours

unit - 6

Transportation and Assignment Problems: The transportation problem; A streamlined simplex method for the transportation problem; The assignment problem; A special algorithm for the assignment problem.

7 Hours

unit - 7

Game Theory, Decision Analysis: Game Theory: The formulation of two persons, zero sum games; Solving simple games- a prototype example; Games with mixed strategies; Graphical solution procedure; Solving by linear programming, Extensions.

Decision Analysis: A prototype example; Decision making without experimentation; Decision making with experimentation; Decision trees.

6 Hours

unit - 8

Metaheuristics: The nature of Metaheuristics, Tabu Search, Simulated Annealing, Genetic Algorithms.

6 Hours

Text Book:

1. **Introduction to Operations Research -** Frederick S. Hillier and Gerald J. Lieberman, 8th Edition, Tata McGraw Hill, 2005.

Reference Books:

1. **Operations Research Applications and Algorithms** - Wayne L. Winston, 4th Edition, Thomson Course Technology, 2003.

2. **Operations Research: An Introduction** - Hamdy A Taha, 8th Edition, Prentice Hall India, 2007.

Compiler Design

Subject Code	
:	**06IS662**
IA Marks	
	: 25
No. of Lecture Hours/Week	

: 04

Exam Hours

	: 03

Total No. of Lecture Hours

: 52

Exam Marks

	: 100

PART - A

Unit - 1

Introduction, Lexical analysis: Language processors; The structure of a Compilers; The evolution of programming languages; The science of building a compiler; Applications of Compiler technology; Programming language basics;

Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.

8 Hours

unit - 2

Syntax Analysis – 1: Introduction; Context-free Grammars; Writing a Grammar; Top-down Parsing.

6 Hours

unit - 3

Syntax Analysis – 2: Bottom-up Parsing; Introduction to LR Parsing: Simple LR.

6 Hours

Unit - 4

Syntax Analysis – 3: More powerful LR parsers; Using ambiguous grammars; Parser Generators.

6 Hours

PART - B

Unit - 5

Syntax-Directed Translation: Syntax-Directed definitions; Evaluation order for SDDs; Applications of Syntax-directed translation; Syntax-directed translation schemes.

6 Hours

unit - 6

Intermediate Code Generation: Variants of syntax trees; Three-address code; Types and declarations; Translation of expressions; Type checking; Control flow; Back patching; Switch statements; Intermediate code for procedures.

8 Hours

unit - 7

Run-Time Environments: Storage Organization; Stack allocation of space; Access to non-local data on the stack; Heap management; Introduction to garbage collection.

6 Hours

unit - 8

Code Generation: Issues in the design of Code Generator; The Target language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator.

6 Hours

Text Book:

1. **Compilers- Principles, Techniques and Tools -** Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman, 2nd Edition, Addison-Wesley, 2007.

Reference Books:

1. **Crafting a Compiler with C -** Charles N. Fischer, Richard J. leBlanc,Jr, Pearson Education, 1991.

2. **Modern Compiler Implementation in C -** Andrew W Apple, Cambridge University Press, 1997.

3. Compiler Construction Principles & Practice - Kenneth C Louden, Thomson Education, 1997.

Data Compression

Subject Code		
:	**06IS663**	

IA Marks	
	: 25

No. of Lecture Hours/Week

: 04

Exam Hours

	: 03

Total No. of Lecture Hours

: 52

Exam Marks

	: 100

PART - A

Unit - 1

Introduction, Lossless Compression -1: Compression techniques; Modeling and coding. Mathematical preliminaries for lossless compression: Overview; Basic concepts of Information Theory; Models; Coding; Algorithmic information theory; Minimum description length principle. Huffman coding: Overview; The Huffman coding algorithm, Minimum variance

Huffman codes; Application of Huffman coding for text compression.

7 Hours

unit - 2

Lossless Compression – 2: Dictionary Techniques: Overview; Introduction; Static dictionary; Adaptive dictionary; Applications: UNIX compress, GIF, PNG, V.42.

Lossless image compression: Overview; Introduction; Basics; CALIC; JPEG-LS; Multiresoution approaches; Facsimile encoding: Run-length coding, T.4 and T.6.

6 Hours

unit - 3

Basics of Lossy Coding: Some mathematical concepts: Overview; Introduction; Distortion criteria; Models.

Scalar quantization: Overview; Introduction; The quantization problem; Uniform quantizer; Adaptive quantization.

6 Hours

unit - 4

Vector Quantization, Differential Encoding: Vector quantization: Overview; Introduction; Advantages of vector quantization over scalar q
uantization; The LBG algorithm.

Differential Encoding: Overview; Introduction; The basic algorithm; Prediction in DPCM; Adaptive DPCM; Delta modulation; Speech coding; Image coding.

7 Hours

PART - B

Unit - 5

Some Mathematical Concepts, Transform coding: Some mathematical concepts: Linear systems; Sampling; Discrete Fourier transform; Z-transform.

Transform coding: Overview; introduction; The transform; Transforms of interest; Quantization and coding for transform coefficients; Application to image compression – JPEG; Application to audio compression – MDCT.

7 Hours

unit - 6

Subband Coding, Audio Coding: Subband Coding: Overview; introduction; Filters; The basic subband coding algorithm; Bit allocation; Application to speech coding – G.722; Application to audio coding – MPEG audio; Application to image compression.

Audio Coding: Overview; Introduction; MPEG audio coding; MPEG advanced audio coding; Dolby AC3; Other standards.

6 Hours

unit - 7

Wavelet-Based Compression: Overview; Introduction; Wavelets; Multiresolution and the scaling function; Implementation using Filters; Image compression; Embedded zerotree coder; Set partitioning in hierarchical trees; JPEG 2000.

6 Hours

unit - 8

Video Compression: Overview; Introduction; Motion compensation; Video signal representation; H.261; Model-based coding; Asymmetric applications; MPEG-1 and MPEG-2; H.263; H.264, MPEG-4 and advanced video coding; Packet video.

7 Hours

Text Book:

1. **Introduction to Data Compression-** Khalid Sayood, 3rd Edition, Elsevier, 2006

Reference Book:

1. **Data Compression the Complete Reference** - D. Salomon, Springer, 1998.

Pattern Recognition

Subject Code		
:	**06IS664**	
IA Marks		
	: 25	
No. of Lecture Hours/Week		
: 04		
Exam Hours		
	: 03	
Total No. of Lecture Hours		
: 52		
Exam Marks		

	: 100

PART - A

Unit - 1

Introduction: Machine perception, an example; Pattern Recognition System; The Design Cycle; Learning and Adaptation.

6 Hours

unit - 2

Bayesian Decision Theory: Introduction, Bayesian Decision Theory; Continuous Features, Minimum error rate, classification, classifiers, discriminant functions, and decision surfaces; The normal density; Discriminant functions for the normal density.

7 Hours

unit - 3

Maximum-likelihood and Bayesian Parameter Estimation: Introduction; Maximum-likelihood estimation; Bayesian Estimation; Bayesian parameter estimation: Gaussian Case, general theory; Hidden Markov Models.

7 Hours

unit - 4

Non-parametric Techniques: Introduction; Density Estimation; Parzen windows; k_n – Nearest-Neighbor Estimation; The Nearest- Neighbor Rule; Metrics and Nearest-Neighbor Classification.

6 Hours

PART - B

Unit - 5

Linear Discriminant Functions: Introduction; Linear Discriminant Functions and Decision Surfaces; Generalized Linear Discriminant Functions; The Two-Category Linearly Separable case; Minimizing the Perception Criterion Functions; Relaxation Procedures; Non-separable Behavior; Minimum Squared-Error procedures; The Ho-Kashyap procedures.

7 Hours

unit - 6

Stochastic Methods: Introduction; Stochastic Search; Boltzmann Learning; Boltzmann Networks and Graphical Models; Evolutionary Methods.

6 Hours

unit - 7

Non-Metric Methods: Introduction; Decision Trees; CART; Other Tree Methods; Recognition with Strings; Grammatical Methods.

6 Hours

unit - 8

Unsupervised Learning and Clustering: Introduction; Mixture Densities and Identifiability; Maximum-Likelihood Estimates; Application to Normal Mixtures; Unsupervised Bayesian Learning; Data Description and Clustering; Criterion Functions for Clustering.

7 Hours

Text Book:

1. **Pattern Classification -** Richard O. Duda, Peter E. Hart, and David G.Stork, 2nd Edition, Wiley-Interscience, 2001.

Reference Books:

1. **Pattern Recognition and Image Analysis -** Earl Gose, Richard Johnsonbaugh, Steve Jost , Pearson Education, 2007.

Computer Graphics and Visualization

Subject Code		
:	**06IS665**	□□ □ □ □ □□

IA Marks

	: 25

No. of Lecture Hours/Week

: 04

Exam Hours

	: 03

Total No. of Lecture Hours

: 52

Exam Marks

	: 100

PART - A

Unit - 1

INTRODUCTION: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer's interface; Graphics architectures; Programmable pipelines; Performance characteristics.

Graphics Programming: The Sierpinski gasket; Programming two-dimensional applications.

7 Hours

unit - 2

The Open GL: The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket; Plotting implicit functions.

6 Hours

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unit - 3

Input and Interaction: Interaction; Input devices; Clients and servers; Display lists; Display lists and modeling; Programming event-driven input; Menus; Picking; A simple CAD program; Building interactive models; Animating interactive programs; Design of interactive programs; Logic operations.

7 Hours

unit - 4

Geometric Objects and Transformations – 1: Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube; Affine transformations; Rotation, translation and scaling.

6 Hours

PART - B

Unit - 5

Geometric Objects and Transformations – 2: Transformations in homogeneous coordinates;

Concatenation of transformations; OpenGL transformation matrices; Interfaces to three-dimensional applications; Quaternions.

5 Hours

unit - 6

Viewing: Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal; Interactive mesh displays; Parallel-projection matrices; Perspective-projection matrices; Projections and shadows.

7 Hours

unit - 7

Lighting and Shading: Light and matter; Light sources; The Phong lighting model; Computation of vectors; Polygonal shading; Approximation of a sphere by recursive subdivisions; Light sources in OpenGL; Specification of materials in OpenGL; Shading of the sphere model; Global illumination.

6 Hours

unit - 8

Implementation: Basic implementation strategies; The major tasks; Clipping; Line-segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions; Rasterization; Bresenham's algorithm; Polygon rasterization; Hidden-surface removal; Antialiasing; Display considerations.

8 Hours

Text Book:

1 **Interactive Computer Graphics A Top-Down Approach with OpenGL -** Edward Angel, 5th Edition, Addison-Wesley, 2008.

Reference Books:

1 **Computer Graphics Using OpenGL -** F.S. Hill,Jr., 2nd Edition, Pearson education, 2001.

2 **Computer Graphics -** James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Addison-wesley 1997.

3 **Computer Graphics- Open GL-** Donald Hearn and Pauline Baker, 2nd Edition, Pearson Education, 2003.