COURSE 15A: OPTIMIZATION TECHNIQUES

Theory   Credits: 3   3 hrs/week

I.   Learning Outcomes

After learning this course, the student will be able
1. To solve the problems in logistics
2. To find a solution for the problems having space constraints
3. To minimize the total elapsed time in an industry by efficient allocation of jobs to the suitable persons.
4. To find a solution for an adequate usage of human resources
5. To find the most plausible solutions in industries and agriculture when a randomenvironment exist.

II.   Syllabus

Unit – 1:
Transportation Problem- Introduction, Mathematical formulation of Transportation problem. Definition of Initial Basic feasible solution of Transportation problem- North-West corner rule, Lowest cost entry method, Vogel's approximation method. Method of finding optimal solution- MODI method(U-V method). Degeneracy in transportation problem, Resolution of degeneracy, Unbalanced transportation problem. Maximization of TP.

Unit – 2:
Assignment Problem -Introduction, Mathematical formulation of Assignment problem, Reduction theorem (statement only), Hungarian Method for solving Assignment for both balanced and unbalanced Assignment Problems.

Unit – 3:
Sequencing problem: Introduction and assumptions of sequencing problem, Sequencing of n jobs and one machine problem. Johnson's algorithm for n jobs and two machines problem- problems with n-jobs on two machines, algorithm for n jobs on three machines problem- problems with n- jobs on three machines, algorithm for n jobs on m machines problem, problems with n-jobs on m- machines.

Unit – 4:
GameTheory:Two-personzero-sumgames.PureandMixedstrategies.Maxmin and Minimax Principles - Saddle point and its existence. Games without Saddle point-Mixed strategies. Solution of 2 x 2 rectangular games. Graphical method of solving 2 x n and m x 2 games. Dominance Property. Matrix oddment method for n x n games. Only formulation of Linear Programming Problem for m x n games.

Unit – 5:
Network Scheduling: Basic Components of a network, nodes and arcs, events and activities– Rules of Network construction – Time calculations in networks - Critical Path method (CPM) and PERT.

SEMESTER-V
COURSE 15A: OPTIMIZATION TECHNIQUES

Practical   Credits: 1   2 hrs/week

Practical Syllabus

1. IBFS of transportation problem by using North- West corner rule, Matrixminimum method and VAM
2. Optimum solution to balanced and unbalanced transportation problems by MODI method(both maximization and minimization cases)
3. Solution of Assignment problem using Hungarian method (both maximization andminimization cases),
4. Solution of sequencing problem—processing of n jobs through two machines
5. Solution of sequencing problem- processing of n jobs through three machines
6. To perform Project scheduling of a given project (Deterministic case-CPM).
7. To perform Project scheduling of a given project (Probabilistic case-PERT).
8. Solution of m x n games by dominance rule.

III.   References

1. S.D. Sharma: Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P.K.Gupta, Manmohan: Operations Research, Sultan Chand and sons, NewDelhi.
3. J.K. Sharma: Operations Research and Application, Mc. Millan and Company, New Delhi.
4. Gass: Linear Programming. Mc Graw Hill.
5. Hadly: Linrar Programming. Addison-Wesley.
6. Taha: Operations Research: An Introduction : Mac Millan.
7. Dr. NVS Raju: Operations Research, SMS education.

IV.   Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

COURSE 15B: APPLIED STATISTICS II

Theory   Credits: 3   3 hrs/week

I.   Learning Outcomes
After learning this course, the student will be able to know about
1. Different growth curves and its methods to construct, expertise with growth curves.
2. Interpret and use a range of index numbers methods commonly used in the business sector.
3. Understand the basic structure of the Demand analysis and perform calculations, involving its use.
4. Calculation of different scores specific to Psychological and Educational statistics.
5. Accustom various methods to calculation test reliability and test scores.

II.   Syllabus

Unit – 1: Growth curves
Modified exponential curve, Logistic curve and Gompertz curve, fitting of growth curves by the method of three selected points and partial sums. Detrending. Effect of elimination of trend on other components of the time series.

Unit – 2: Index Numbers
Base shifting, calculation of index numbers with different bases – Fixed base and Chain base, splicing of index numbers series, Deflating the Index numbers. Index number of Industrial production, Interim Index number of Industrial production, Revised Index number of Industrial production.

Unit – 3: Demand Analysis
Introduction, price Elasticity of demand, partial Elasticities of demand, types of data required for estimating Elasticities, Leontief's method, Pigou's method (from time series data), Pigou's method (from family budget data), Engel's curve and Engel's law, Pareto's law of income distribution, Formulation of the problem, Curves of concentration.

Unit – 4: Psychological and Educational Statistics
Introduction, scaling individual test items in terms of difficulty (sigma scaling), scaling of scores on a test, Z score and Z scaling, standard scores, normalized scores, T-scores, percentile scores, scaling of rankings in terms of normal probability curve and scaling of ratings in terms of normal curve.

Unit – 5:
In Reliability of test scores, error variance or standard error of measurement, index of reliability, parallel tests, method of determining test reliability (the test-retest method, the Rulon method of estimating reliability, method of rational equivalence or Kuder-Richardson formula), validity of test scores, calculation of validity, validity and test length, comparison between reliability and validity, and intelligence quotient.

COURSE 15B: APPLIED STATISTICS II

Practical	Credits: 1	2 hrs/week

Practical Syllabus

1. Fitting of modified exponential curve (using method of three selected points)
2. Fitting of modified exponential curve (using method of partial sums)
3. Fitting of Gompertz curve (using method of three selected points)
4. Fitting of Gompertz curve (using method of partial sums)
5. Fitting of Logistic curve (using method of partial sums)
6. Finding index numbers by shifting the base.
7. Calculation of Fixed and Chain base index numbers.
8. Splicing two index number series.
9. Deflating index number.
10. Calculation of income and price elasticities.
11. Fitting of Pareto's curve to the given data.
12. Calculation of test reliability using the difficulty values of items and S.D of the total scores and mean and S.D of the total scores.

III. References

1. Fundamentals of applied statistics: VK Kapoor and SC Gupta.
2. Mukopadhyay, P (2011): Applied Statistics, 2nd ed. Revised reprint, Books and Allied Pvt. Ltd.
3. Brockwell, P.J. and Devis, R.A. (2003): Introduction to Time Series Analysis. Springer.
4. Chatfield, C. (2001): Time Series Forecasting., Chapman & Hall.
5. Srinivasan, K. (1998): Demographic Techniques and Applications. Sage Publications
6. Srivastava O.S. (1983): A Text Book of Demography. Vikas Publishing House.

IV. Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
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