

SEMESTER-V
COURSE 14A: OPERATIONS RESEARCH

Theory

Credits: 3

3 hrs/week

I. Learning Outcomes

After learning this course, the student will be able

1. To know the scope of Operations Research
2. To link the OR techniques with business environment and life sciences
3. To convert real life problems into mathematical models
4. To find a solution to the problem in different cases
5. To inculcate logical thinking to find a solution to the problem

II. Syllabus

Unit – 1:

Introduction of OR – Origin and development of OR – Nature and features of OR –Scientific Method in OR – Modeling in OR – Advantages and limitations of Models-General Solution methods of OR models – Applications of Operation Research. Linear Programming problem (LPP) – Mathematical formulation of the problem - illustrations on Mathematical formulation of Linear Programming of problem.

Unit – 2:

Graphical solution of linear Programming problems with maximizing and minimizing objective function up to 3 variables. Finding convex hull and non-convex hull of LPP. Some exceptional cases - Alternative solutions, Unbounded solutions, non-existing feasible solutions by Graphical method.

Unit – 3:

General linear Programming Problem(GLP) – Definition and Matrix form of GLP problem, Slack variable, Surplus variable, unrestricted Variable, Standard form of LPP and Canonical form of LPP. Definitions of Solution, Basic Solution, Degenerate Solution, Basic feasible Solution and Optimum Basic Feasible Solution. Introduction to Simplex method and Computational procedure of simplex algorithm. Solving LPP by Simplex method (Maximization case and Minimization case up to three variables only)

Unit – 4:

Artificial variable technique - Big-M method and Two-phase simplex method, Degeneracy in LPP and method to resolve degeneracy. Alternative solution, Unbounded solution, Non existing feasible solution and Solution of simultaneous equations by Simplex method.

Unit – 5:

Duality in Linear Programming –Concept of duality -Definition of Primal and Dual Problems, General rules for converting any primal into its Dual, Relation between the solution of Primal and Dual problem (statements only). Using duality to solve primal problem. Dual Simplex Method.

SEMESTER-V
COURSE 14A: OPERATIONS RESEARCH

Practical

Credits: 1

2 hrs/week

Practical Syllabus

1. To solve Linear Programming Problem using Graphical Method with
 - i. Unbounded solution
 - ii. Infeasible solution
2. Solution of LPP with simplex method.
3. Problem solving using Big M - method.
4. Problem solving using Two Phase method.
5. Illustration of following special cases in LPP using Simplex method
 - iii. Unbounded solution
 - iv. Alternative or multiple solutions.
6. Problems based on Principle of Duality.
7. Problems based on Dual simplex method.

III. References

1. S.D. Sharma: Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P.K.Gupta, Manmoh: Operations Research, Sultan Chand and sons, NewDelhi.
3. J.K. Sharma: Operations Research and Application, Mc.Millan and Company, New Delhi.
4. Gass S.I: Linear Programming. Mc Graw Hill.
5. Hadly G: Linear Programming. Addison-Wesley.
6. Taha H.M: Operations Research: An Introduction : Mac Millan.

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.

SEMESTER-V
COURSE 14B: STATISTICAL QUALITY CONTROL

Theory

Credits: 3

3 hrs/week

I. Learning Outcomes

After learning this course, the student will be able

1. To define 'quality' in a scientific way
2. To differentiate between process control and product control
3. To speak about quality awareness in industry
4. To pave a path to an industry to meet the standards
5. To effectively implement various plans to control the quality standards at various stages of an industry.

II. Syllabus

Unit – 1:

Importance of SQC – 4 M's of SQC, causes of variation – Assignable and chance cause of variation, uses, process and product control, Control charts technique, Statistical basis of Shewhart control charts.

Unit – 2: Control charts for Variables

Introduction and Construction of Mean and Range chart; Mean and Standard Deviation Chart when standards are specified and unspecified, corrective action if the process is out of statistical control.

Unit – 3: Control charts for Attributes

Introduction and Construction of fraction defective chart, number of defectives chart, no. of defects per unit Chart and U charts when standards are specified and unspecified, corrective action if the process is out of statistical control.

Unit – 4:

Acceptance Sampling for Attributes: Introduction, Concept of sampling inspection plan, Comparison between 100% inspection and sampling inspection. Procedures of acceptance sampling with rectification, Producer's risk and Consumer's risk, Operating characteristic (OC) curve, Acceptable Quality Level (AQL), Lot Tolerance Fraction Defective (LTFD) and Lot Tolerance percent Defective (LTPD), Average Outgoing Quality (AOQ) and Average Outgoing Quality Limit (AOQL), AOQ curve, Average Sample Number (ASN), Average Total Inspection (ATI).

Unit – 5:

Single Sampling Plan: Computation of probability of acceptance using Binomial and Poisson approximation, of AOQ and ATI. Graphical determination of AOQL, Determination of a single sampling plan by: a) lot quality approach b) average quality approach.

SEMESTER-V
COURSE 14B: STATISTICAL QUALITY CONTROL

Practical

Credits: 1

2 hrs/week

Practical Syllabus

1. Construction of Mean and R Charts.
2. Construction of Mean and Standard deviation charts.
3. Construction of p Chart for fixed sample size.
4. Construction of p Chart for variable sample size.
5. Construction of np Chart.
6. Construction of C chart.
7. Construction of U chart.
8. Single sampling plan for attributes (OC Curve, Producer's and Consumer's risks, AOQ, AOQL, ATI).
9. Determination of single sampling plan by: a) lot quality approach b) average quality approach.

III. References

1. Montgomery, D. C. (2008): Statistical Quality Control, 6thEdn., John Wiley, New York.
2. Parimal Mukhopadhyay: Applied Statistics, New Central Book Agency.
3. Goon A.M., Gupta M.K. and Das Gupta B. (1986): Fundamentals of Statistics, Vol. II, World Press, Calcutta.
4. S.C. Gupta and V.K. Kapoor: Fundamentals of Applied Statistics – Chand publications.
5. R.C. Gupta: Statistical Quality Control.
6. Duncan A.J. (1974): Quality Control and Industrial Statistics, fourth edition
7. D.B. Taraporewala Sons and Co. Pvt. Ltd., Mumbai.

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