

# OPERATIONS RESEARCH



Course Title	Operations Research
Semester	II
Batch	2022-2024
Credit	2
Duration	20 hours (75 minutes per session)
Faculty	Vijayanta Pawase

## Operations Research

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Course Code	Description	Cognition	Hours	Evaluation Tools
CO-1	Understand the relevance and scope of Operations Research in providing solutions to various business problems.	K2: Understand	1.25	End term: Theory
CO-2	Apply Operations Research methods and techniques to solve business problems.	K3: Applying	10.75	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
CO-3	Analyze the Operations Research techniques for solving business constraints/problems.	K4: Analyzing	4	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
CO-4	Interpret the mathematical solution/output generated by the OR techniques for a business problem.	K5: Evaluating	2.25	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
CO-5	Formulate business situations/problems into mathematical OR models for finding pragmatic solutions.	K6: Creating	1.75	Internal Evaluation: Class Test & Assignment End term: Sum and Theory

### Mapping COs with POs

Scale: 1= Low Alignment, 2=Moderate Alignment, 3=High Alignment, - =No Alignment

COs / POs Code	PO1	PO2	PO3	PO4	PO5
CO-1	2	2	0	3	1
CO-2	3	3	2	3	3
CO-3	3	3	2	3	3
CO-4	3	3	2	3	3
CO-5	3	3	0	3	3
CO	2.8	2.8	1.2	3	2.6
CO EQ	3	3	1	3	3



### Session Plan

Session No.	Hours	Units	COs	Topics Mapped with CO	Evaluation Tools
<b>1</b>	<b>1.25</b>	<b>Introduction to Operations Research</b>			
	1.25	Introduction to Operations Research subject matter and importance of quantification for achieving better results or decisions.	CO-1	K2: Understand	End term: Theory
<b>2 to 4</b>	<b>3.75</b>	<b>Linear Programming</b>			
	1.25	Formulation of LPP, and model formulation for more than 2 variables.	CO-5	K6: Creating-	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
	1.25	Graphical solutions, and Simplex	CO-2	K3: Applying	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
	1.25	Sensitivity Analysis	CO-3	K4: Analyzing-	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
<b>5 to 7</b>	<b>3.75</b>	<b>Transportation Models</b>			
	2.5	Methods of Feasible Solution: North-West Corner Rule, Row Mini-Max, Column Mini-Max, Least Cost Method, Vogel's, Modi Method, Degeneracy, Unbalanced Transportation Problems,	CO-2	K3: Applying	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
	1.25	Maximization, and Minimization Types Problem, Allocation Restrictions.	CO-3	K4: Analyzing-	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
<b>8 &amp; 9</b>	<b>2.5</b>	<b>Assignment Models</b>			
	1.5	HAM Method, Balanced and Unbalanced problem	CO-2	K3: Applying	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
	1	Maximization and Minimization Types	CO-3	K4: Analyzing-	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
<b>10 &amp; 11</b>	<b>2.5</b>	<b>Markov Chains</b>			
	2.5	Introduction of Matrices (Matrix Multiplication), Transition matrix, and prediction for next year.	CO-2	K3: Applying	Internal Evaluation: Class Test & Assignment End term: Sum and Theory

<b>12</b>	<b>1.25</b>	<b>Simulation</b>			
	1.25	Process of Simulation, Monte Carlo Simulation Techniques, and Simulation Queuing Models, Inventory Models, Planning, etc.	CO-2	K3: Applying	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
<b>13</b>	<b>1.25</b>	<b>Decision Theory</b>			
	0.5	Payoff Table, and Opportunity Loss or Regret Table	CO-5	K6: Creating-	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
	0.75	Decision Rules, and Decision making under the conditions of certainty, uncertainty, risk, and competition or conflict.	CO-2	K3: Applying	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
<b>14 &amp; 15</b>	<b>2.5</b>	<b>Game Theory</b>			
	1	Game Models, Two-person Zero-Sum Game,	CO-2	K3: Applying	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
	1	Solution of 2 x n and n x 2 Games, Games of Pure and Mixed Strategy,	CO-4	K5: Evaluating-	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
	0.5	Principle of Dominance	CO-3	K4: Analyzing-	Internal Evaluation: Class Test & Assignment End term: Sum and Theory
<b>16</b>	<b>1.25</b>	<b>Excel applications for model solving using Solver software.</b>	<b>CO-4</b>	<b>K5: Evaluating-</b>	<b>Internal Evaluation: Assignment</b>

#### Assessment Criteria:

<b>Evaluation:</b>	
Internal Assessment	20 Marks
External Assessment	30 Marks
Total	50 Marks

<b>Internal Assessment:</b>	
Class Attendance	5 Marks
Class Participation	5 Marks
Class Test	5 Marks
Assignment	5 Marks

<b>External Assessment:</b>	
End Term Examination	30 Marks

**Assessment Mapping**

Parameter	Marks	CO-1	CO-2	CO-3	CO-4	CO-5
Internal	20	10%	40%	20%	15%	15%
Class Attendance	5	20%	20%	20%	20%	20%
Class Participation	5	20%	20%	20%	20%	20%
Class Test	5		60%	20%	10%	10%
Assignment	5		60%	20%	10%	10%
End Term	30	10%	50%	20%	10%	10%
Total	50	10%	46%	20%	12%	12%

**Textbook:**

Introduction to Operations research, Frederick S. Hillier, 10<sup>th</sup> Edition, McGraw Hill Education, Special Indian edition 2017

**Reference Books:**

Quantitative Techniques in Management, N D Vohra, 4th Edition, Tata McGraw Hill, 2nd reprint, 2010.  
 Quantitative Methods Theory and applications, J K Sharma, Mac Milan, 2010.  
 Operations research, Prem Kumar Gupta, S Chand, Edition seventh, 2014  
 Quantitative Techniques for Decision making - Anand Sharma Himalaya Publishing – reprint 2011  
 Quantitative Methods for Business - Anderson, Sweeney & Williams, Cengage Learning, Edition sixth, 2010.

**e-Textbook:**

Operations Research by [Dr. Yazan K.A-A. Migdadi](https://bookboon.com/en/operations-research-ebook) <https://bookboon.com/en/operations-research-ebook>