Course Title	**Methods of Operational Research I**
Course Code	**MAN 103 1.0**
Credit Value	01
Status	Core
Year / Level	Year 1
Semester	Semester 1
Theory: Practical: Independent Learning	13: 00: 26
Other: Pre-requisite Course/s	None

Aim of the Course:

To provide a basic understanding about operations research and its role in present world by providing a sound foundation for understanding the concepts, theory and applications of operations research by integrating numerous examples.

Intended Learning Outcomes:

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

1) Identify operational research problems (linear programing/transportation).
2) apply mathematical techniques to solve linear programing problems (minimization/maximization)
3) apply mathematical techniques to study the results of solved problems. (duality/sensitivity)
4) apply mathematical techniques to solve transportation problems.

Course Content:

Methods in Operation Research; Introduction to linear programming; Formation of linear programing problem; objective function; Constraints;
Solving linear programing problem; Minimization and Maximization of objective function;
Graphical Method;
Standard form of a linear programing problem; slack/surplus variables; negative variables; Simplex Method;
Artificial variable technique; Types of Solutions in a LPP; optimal solution;
Duality theory; Formation of the dual problem; Dual simplex method;
Sensitivity analysis/post optimality analysis; Changes of the initial problem;
Transportation model; Mathematical formulation; Methods for initial basic feasible solution; Optimal solution; Unbalanced transportation problem;

Scope and Schedule of Teaching - Learning Activities:

Session No.	Topic / Sub Topic	No. of Hrs.			Teaching Method	Assessment Criteria	ILO Alignment
		T	P	IL			
1	**1 Introduction to operational research** 1.1 Terminology, Phase of OR 1.2 Methods in operations research	1	-	2	Lecture / Chapter 1		1,2
2	**2 Introduction to linear programming** 2.1 Basic requirements 2.2 Steps involved	1	-	2	Lecture / Chapter 2		1,2
3	2.3 Assumptions made 2.4 Solutions of a LPP	1	-	2	Lecture / Chapter 2		1,2
4	**3 The graphical method** 3.1 Terminology	1	-	2	Lecture / Chapter 3		1,2
5	3.2 Methods to optimal solution 3.3 Practical steps	1	-	2	Lecture / Chapter 3		1,2
6	**4 Simplex method** 4.1 Standard form 4.2 Slack and Surplus variables	1	-	2	Lecture / Chapter 4		1,2
7	4.3 Negative variables 4.4 Maximization problems with $\leq$ constraints	1	-	2	Lecture / Chapter 4		1,2
8	4.5 Artificial variables techniques	1	-	2	Lecture / Chapter 4		1,2
9	4.6 Minimization 4.7 Special cases in Simplex method	1	-	2	Lecture / Chapter 4		1,2
10	**Mid-Semester Examination**	0	0	0	Mid-Sem. Examination	30% of Final Marks	
11	**5 Duality Theory and Sensitivity Analysis** 5.1 Formulation of dual problem 5.2 Characteristics and Shadow price	1	-	2	Lecture / Chapter 5		1,2,3
12	5.3 Introduction to Sensitivity analysis 5.4 Changes of optimal answers due to changes of the problem.	1		2	Lecture / Chapter 5		
13	**6 Transportation model** 6.1 Formulation 6.2 Methods for initial feasible solution	1	-	2	Lecture / Chapter 6		1,2,3,4
14	6.3 Finding optimal solution 6.4 Unbalanced problem	1	-	2	Lecture / Chapter 6		1,4
	Total	*13*	-	*26*			

Linking Program Outcomes with ILOs:

Programme Learning Outcomes:

1. Demonstrate competency in theoretical knowledge and practical and/or technical skills in respective subject areas.
2. Communicate efficiently and effectively in the respective subject areas using written, oral, visual and/or electronic forms.
3. Facilitate, and participate as an empathetic and emotionally intelligent team player with leadership qualities, in a group, diverse team or organization.
4. Apply subject based knowledge and skills creatively in making appropriate judgments in changing situations.
5. Integrate creativity and innovation to achieve entrepreneurial competencies.
6. Implement solutions in keeping with ethical, societal and environmental norms and need for sustainable development.
7. Secure life goals through lifelong learning with the aim of strengthening professional skills, and ensuring the betterment of the community.

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
ILO 1	**			*	*		**
ILO 2	**			*			**
ILO 3	***	**	*	**		*	**
ILO 4	**	*		**			**

**** - Strongly Linked; ** - Medium linked; * Weakly linked*

Mode of Assessment:

Formative Assessment (FA): FA1 30% = 30% of Total Marks

Summative Assessment (SA): End Semester Examination: 2-hour paper = 70% of Total Marks

References

- Operations Research – Rathindra P.Sen
- Operations Research – P.K.Gupta, D.S.Hira
- Operations Research – Sudath Manjula Amarsena (A Sinhala Text Book)