GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Business Administration (Part-Time), 4th Semester

Specialization: Production and Operations Management

Subject Name: Operations Research

Subject Code: 5549934

1. Learning Outcomes:

Learning Outcome Component	Learning Outcome
Business Environment and Domain Knowledge (BEDK)	• Define and formulate linear programming problems. •
Critical thinking, BusinessAnalysis, Problem Solving and Innovative Solutions (CBPI)	• Sole OR problems using appropriate tools and techniques, interpret the results and translate results into directives for action. • Ability to implement practical cases by using TORA.
Global Exposure and Cross-Cultural Understanding (GECCU)	• Understanding the universal applicability of the OR tools and techniques.
Social Responsiveness and Ethics (SRE)	• Evaluate the shortcomings of these tools, and assess trade-offs without compromising stakeholder interests and well-being.
Effective Communication (EC)	• Communicate ideas, explain procedures and interpret results and solutions in written and electronic forms to different audiences with clarity and conviction.
Leadership and Teamwork (LT)	• Define the roles and responsibilities of operations managers, and the challenges they face. • Ability to lead through decisive choices backed by objective analysis.

LO – PO Mapping: Correlation Levels:

1 = Slight (Low); 2 = Moderate (Medium); 3 = Substantial (High), "-"= no correlation

Sub. Code: 5549934	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
LO1: *Develop* an understanding and appreciation of linear optimization models as effective tools in addressing problemsthat are relevant to decisionmaking in business, economics and other related areas.	**3**	**3**	**1**	**1**	**1**	**1**	**-**	**1**	**3**
LO2: *Formulate* Linear Programming models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these LP problems.	**2**	**2**	**3**	**2**	**1**	**2**	**-**	**1**	**2**
LO3: *Formulate* Network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these Network problems.	**2**	**2**	**3**	**2**	**1**	**2**	**-**	**1**	**2**
LO4: *Appraise* the latest mathematical model(s) and									

software tools to make optimal decisions under conditions of certainty, risk and uncertainty.	**3**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**2**
LO5: *Formulate* Queuing models for service and manufacturing systems, and *apply* operations research techniques and algorithms to solve these Queuing problems to enhance customer service.	**3**	**3**	**1**	**2**	**1**	**1**	**3**	**1**	**1**
LO6: *Develop* operational research models from the verbal description of the real system.	**1**	**2**	**1**	**3**	**-**	**-**	**1**	**1**	**2**
L07: *Identify* project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in order to achieve project success.	**3**	**1**	**1**	**3**	**-**	**3**	**1**	**1**	**1**

2. **Course Duration:** The course duration is of **40 sessions of 60 minutes each.**

3. **Course Contents:**

Module No:	Contents	No. of Sessions	70 Marks (External Evaluation)

I	**Operations Research:**
	• Definition, Features of OR approach
	• Modelling in OR:
	  ○ Mathematics – The Language of Modelling
	  ○ Classification of models
	  ○ Building a Mathematical Model, Verifying and Refining a Model, Variables and Parameters
	  ○ Advantages of model building
	• Methodology of Operations Research
	
	Linear Programming:
	• Structure of the Linear Programming model
	• Advantages, limitations and applications
	• Guidelines on linear programming model formulation
		10	18

II	**Linear Programming: Graphical Method: (Theory and numerical)** • Graphical solution methods: • Extreme point solution method, Maximization and Minimization Models, mixed constraints • Alternative optimal solutions, Unbounded Solution, infeasible solution, redundancy **Linear Programming: Simplex Method: (Theory and**	10	18

	numerical)
	• Additional Variables Used in Solving LPP
	• Maximization Case
	• Minimization LP Problems
	  o Two phase method, Big M Method,
	• Resolving complications
	  o Unrestricted variables, Degeneracy
	• Types of solutions
	  o Optimal, unbounded, infeasible
	
	Solving LP Problems using Computer With TORA.
	Duality in LPP Problems
	Sensitivity Analysis (Only theory)		

III	**Transportation Model: (Theory and numerical)**
	• Mathematical Formulation, Network Representation of Transportation Model, General Representation of Transportation Model.
	• Finding initial solutions:
	  ▪ North-West Corner Method, Least Cost Method, Vogel's Approximation Model
	• Variations:
	  o Unbalanced supply and demand
	  o Degeneracy
	  o Alternative optimal solutions
	  o Prohibited routes
	• Maximization Transportation Problem.
	• Transshipment Problem.
	
	Waiting Model (Queuing Theory):
	• Queuing Systems, Characteristics of Queuing System
	• Structure of a queuing system, performance measures, probability distributions in queuing systems
	• Classification of queuing models
	• Symbols and Notations,
	• Single Server Queuing Model
	• Solving The Problem using Computer with TORA
		10	17

IV	**Markov Chains: (Only theory)** • Characteristics, applications • State and transition probabilities • Steady state equilibrium **Game Theory:** • Introduction • Two-Person Zero-Sum Game • Pure Strategies: Game with Saddle Point • Mixed Strategies: Games without Saddle Point, Dominance Property • Solving Problem on the Computer with TORA • Solving LP Model Games Graphically Using Computer	10	17

	Simulation: • Definition, types, steps of simulation • Advantages and Disadvantages of Simulation • Monte Carlo Simulation • Simulation of Demand Forecasting Problems • Simulation of Queuing Problems.		
V	**Practical:** • Conduct simulations for transportation, queuing and network problems. • Solve operations management problems using OR tools and techniques. • Conduct OR problems on software.	---	(30 marks CEC)

4. Pedagogy:

- ICT enabled Classroom teaching
- Case study
- Practical / live assignment
- Interactive class room discussions

5. Evaluation:

Students shall be evaluated on the following components:

A	**Internal Evaluation**	**(Internal Assessment- 50 Marks)**
	• Continuous Evaluation Component	30 marks
	• Class Presence & Participation	10 marks
	• Quiz	10 marks
B	**Mid-Semester examination**	**(Internal Assessment-30 Marks)**
C	**End –Semester Examination**	**(External Assessment-70 Marks)**

6. Reference Books:

No.	Author	Name of the Book	Publisher	Year of Publication / Edition
1	S. R. Yadav, A. K. Malik	Operations Research	Oxford	2014
2	J. K. Sharma	Operations Research: Theory and Application	Trinity Press	2017
3	Hamdy A. Taha	Operations Research : An Introduction	Pearson	Latest Edition
4	P. Mariappan	Operations Research	Pearson	2013
5	Frederick S. Hillier, Gerald J. Liberman	Introduction to Operations Research	McGraw Hill	Latest Edition
6	Prem Kumar Guptha, D. S. Hira	Operations Research	S. Chand	2014

Note: Wherever the standard books are not available for the topic appropriate print and online resources, journals and books published by different authors may be prescribed.

7. List of Journals / Periodicals/Magazines/Newspapers / Web resources, etc.

1. International Journal of Operational Research
2. International Journal of Applied Operational Research

3. Opsearch (Journal published by Operational Research Society of India)
4. The IUP Journal of Operations Management
5. http://ifors.org/india/

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6. International Journal of Operational Research
7. International Journal of Applied Operational Research
8. Opsearch (Journal published by Operational Research Society of India)
9. The IUP Journal of Operations Management