

**M.Sc. (CA) (2<sup>nd</sup> Semester)**

040020206 : Computer Oriented Operations Research Methods

**Teaching Schedule****Objective:**

To introduce basic understanding of mathematical model formulation and findi optimize solution of real world problem with applications to computer science.

**Course Outcomes:**

CO1: Identify and formulate mathematical models from description of the real problems.

CO2: Recognize the importance and value of Operations Research to solve practical problems.

CO3: To gain an understanding of operation research methods namely Linear Programming, Transportation Problem and Assignment Problem to interpret and analyze optimal solution of real problems.

CO4: Ability to understand and analyze managerial problems to optimize resources namely manpower, cost and time.

CO5: To design a model of a real system and conducting experiments for the purpose of understanding the behavior of the system and evaluating strategies for the system.

Unit	Sub Unit	No. of Lecture(s)	Topics	Reference Chapter/Additional Reading	Teaching Methodology	Evaluation Parameters
<b>Unit 1: Introduction of Operations Research and Linear Programming</b>						
	1.1	2	Introduction of OR, Characteristic, Phases, Scope of OR	JK #1 - pg no. 2 – 5 VK#1- pg no.. 1.2-1.12	Chalk & Talk, Power point presentation	Quiz-1
	1.2	2	Drawbacks and difficulties of OR	JK #1 – pg no. 16		
	1.3	2	Introduction and Formulation of LPP with	JK #2 – pg no.. 28-29 JK #2 – pg no. 31-59		

			Assumptions			
	1.4	2	Graphical Method of LPP	JK #3 – pg no..72-94		
<b>Unit 2: Simplex Method for Solution of LPP</b>						
	2.1	1	Standard form of an LP problem	JK#4– pg no. 104-108	Chalk & Talk, Power point presentation	Quiz-1
	2.2	2	Simplex Algorithm for Maximization case	JK#4– pg no. 108-115		
	2.3	2	Simplex Algorithm for Minimization case; Big-M Method	JK#4– pg no. 115-130		
	2.4	2	Alternative optimal solution, unbounded solution and Infeasible in terms of the termination of simplex method	JK#4– pg no. 139-142		
<b>Unit 3: Transportation and Assignment Problem (TP &amp; AP)</b>						
	3.1	1	Mathematical formulation of TP	JK#9– pg no. 261-262	Chalk & Talk, Power point presentation	Unit test- 1
	3.2	2	Initial Basic feasible Solution: Vogel's Approximation Method(VAM)	JK#9– pg no. 265-267		
	3.3	2	Testing for Optimality and finding Optimum solution by Modi Method	JK#9– pg no. 269-280		
	3.4	2	Mathematical formulation of AP	JK#10– pg no. 314-317		
	3.5	2	Solving Assignment	JK#10– pg no. 317-321		

			problem by Hungarian Method			
<b>Unit 4: Games Theory and Sequencing Problems</b>						
	4.1	1	Introduction of Theory of Game	JK#12- pg no. 392-393	Chalk & Talk, Power point presentation	Unit test-2
	4.2	2	Two-Person Zero-Sum Game	JK#12- pg no. 393-395		
	4.3	2	Rules to determine the Saddle point and Games with Saddle point(Pure Strategies)	JK#12- pg no. 395-397		
	4.4	1	Notations, Terminology and assumptions of Sequencing Problems	JK #20 - Page no.724		
	4.5	1	Processing two jobs through two Machines	JK #20- pg no. 736-738		
	4.6	1	Processing two jobs through m Machines	JK #20- pg no. 736-738		
<b>Unit 5: Project Scheduling (CPM and PERT)</b>						
	5.1	2	Introduction	JK #13 - pg no.426	Chalk & Talk, Power point presentation	Unit test-2
	5.2	2	Basic differences between PERT and CPM	JK #13 -pg no. 426-427		
	5.3	2	Network Diagrams	JK #13 -pg no. 428-434		
	5.4	1	Critical Path Method	JK #13 -pg no. 436-442		
	5.5	1	PERT calculations	JK #13 -pg no. 445-449		

<b>Unit 6: Simulation</b>						
	6.1	1	Simulation defined, Advantages and Disadvantages of simulation	JK #19 – pg no. 689 JK #19 – pg no. 692	Chalk & Talk, Power point presentation	
	6.2	2	Types of simulations and steps of simulation process	JK #19 –pg no. 690-692		
	6.3	2	Stochastic simulation and random numbers	JK #19 – pg no.692-694		
	6.4	1	Simulation of pert problems	JK #19 –pg no. 711-713		
	6.5	2	Role of Computers in simulation and its Applications	JK #19 –pg no. 713-714		
<p><b>Text Book:</b>  1. J. K. Sharma, Operations Research – Theory and Application,4th Edition, Macmillan Publishers India Ltd. [JK].</p> <p><b>Reference Books:</b>  1. P SankarAiyer, Operation Research – Sigma Series, Tata McGrow-Hill Companies  2. Shah, Gor, Soni, Operations Research, PHI.  3. V. K. Kapur, Operations Research – Problems &amp; Solutions, Sultan Chand &amp; Sons. [VK]  4. Frederick S. Hilliesr and Gerald J. Liberman, Introduction to Operation Research, The McGrow-Hill Companies.  Note : # denotes chapter number.</p>						

**Course objectives and Course outcomes mapping:**

- To formulate mathematical model: CO1, CO2, CO3.
- To find optimize solutions of problems: CO3, CO4, CO5.

**Course units and Course outcomes mapping:**

Unit No.	Unit	Course Outcome				
		CO1	CO2	CO3	CO4	CO5
1	Introduction of operation Research and Linear Programming	✓	✓			
2	Simplex method for solution of LPP	✓	✓	✓		
3	Transportation and Assignment Problem	✓	✓	✓	✓	
4	Game Theory and Sequencing Problem		✓	✓	✓	✓
5	Project Scheduling(CPM and PERT)		✓	✓	✓	
6	Simulation	✓	✓			✓

**Course outcomes and Programme outcomes mapping:**

The student will have

PO1: Proficiency in and ability to apply knowledge of computer science and application and mathematics through different equations, probability and statistics.

PO2: Ability to design and develop system, component or process as well as test and maintain it.

PO3: Understanding of professional and ethical responsibility

PO4: Recognition of the need for and an ability to engage in life-long learning

PO5: Knowledge of modern issues

PO6: Ability to use the techniques, skills and modern tools as necessary for software development

	PO1	PO2	PO3	PO4	PO5	PO6
C01	✓					
C02					✓	
C03						✓
C04	✓					
C05		✓				

### **Modes of Transaction (Delivery):**

Appropriate methods of teaching shall be employed depending on the objectives of the content taught.

- Lecture method shall be used but along with it, as and when required, discussion method would be fruitful. It may be supplemented with various appropriate audio-visual aids.
- Assignment activity should be designed and given to group of student for solution.
- Tutorial should be used to solve students' queries

### **Activities/Practicum:**

The following activities shall be carried out by the teachers.

1. To aware students about current practices of Operations research in computer science.
2. To introduce the Applications of Transportation and assignment problems in computer science

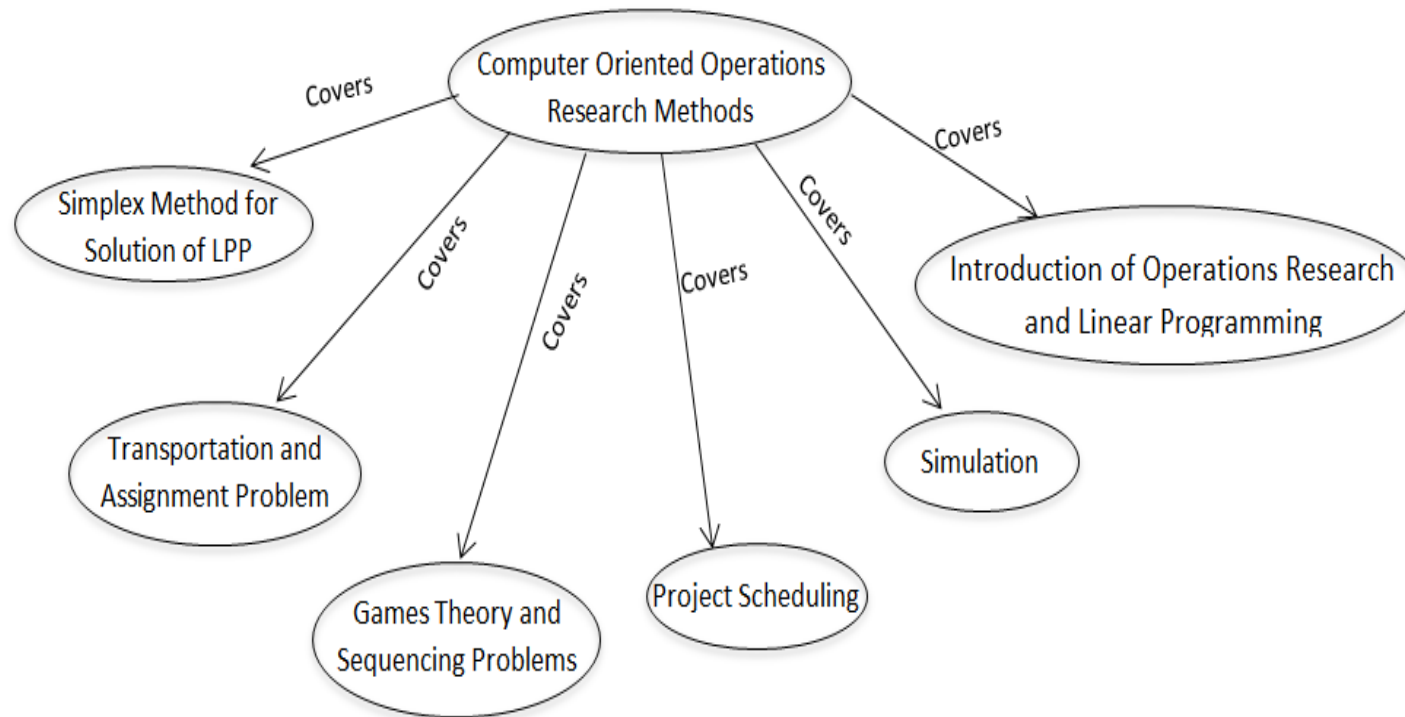
The following activities shall be carried out by the students.

1. To solve case study for the problems namely Transportation, Assignment and game theory
2. To find out applications of Operations research in Networking.
3. Implementation of operation research methods using programming language.

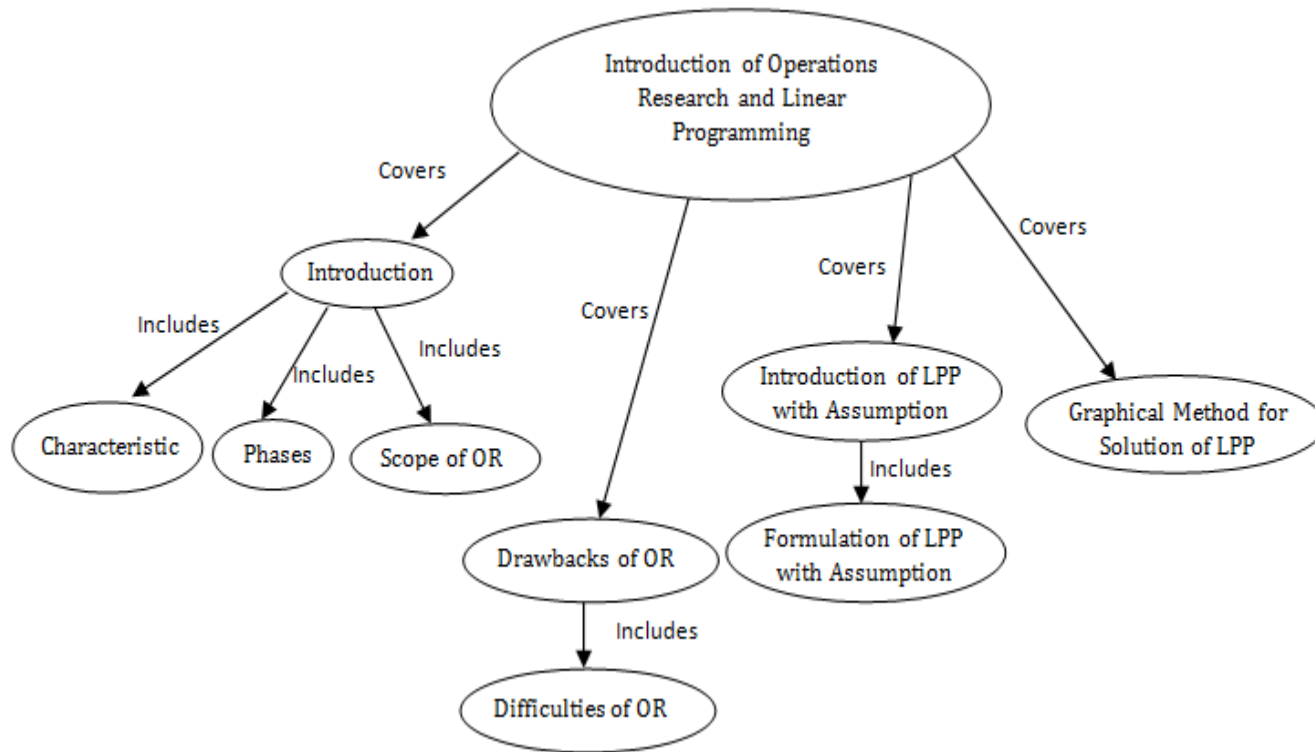
**Concept map:**

Concept Map:

Computer Oriented Operations Research Methods

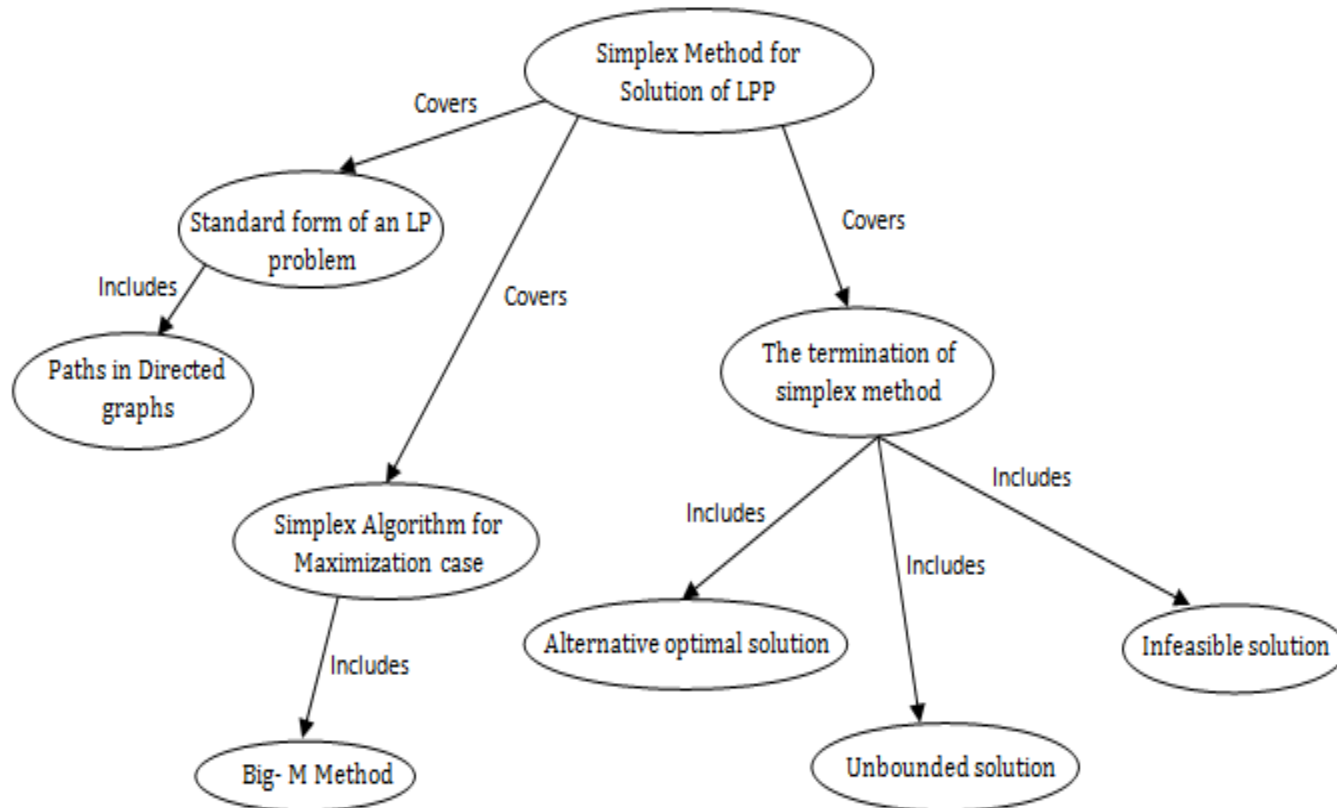


Unit 1

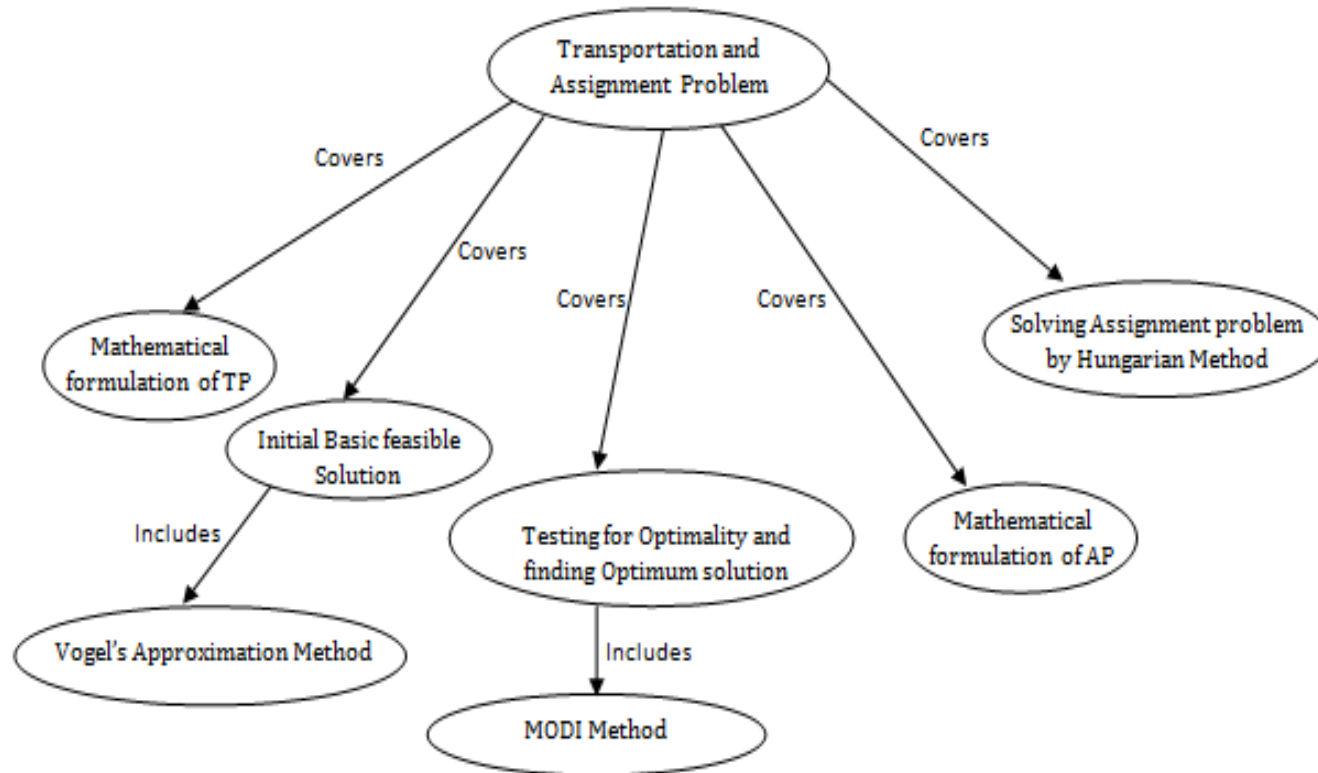




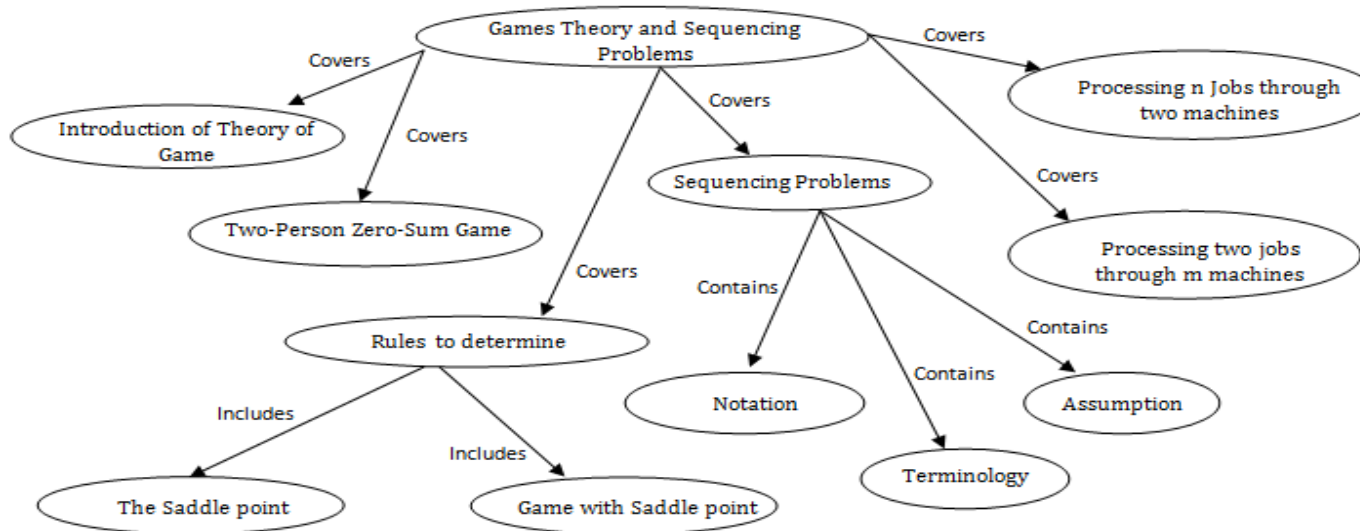
## Unit 2



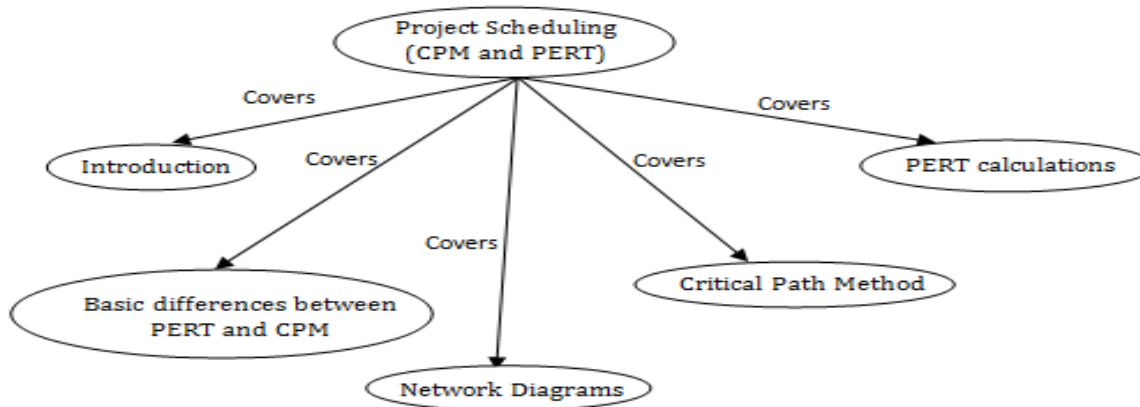
Unit 3



Unit 4



Unit 5



## Unit 6

