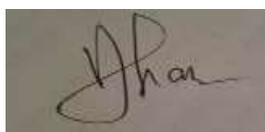


## Department of MBA

### Details of Lesson Plan

S.No.	Particulars	Details
1.	Course Name	Operations Research
2.	Course Code	MBA-203
3.	Academic Year	2024-25
4.	Semester	2 <sup>nd</sup>
5.	Number of Lesson plans	40
6.	Faculty Assigned	Dr Amanpreet Kaur



Faculty Signature

<b>Lesson Plan No. 0</b>	<b>Course Name: Operations Research</b> <b>Topic: Introduction to the Course</b>	<b>Course No.: MBA-203</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. Define Operations Research and understand its significance in decision-making processes.</li> <li>b. Identify real-world applications of OR across various industries.</li> <li>c. Analyze complex problems using OR methodologies.</li> <li>d. Evaluate the impact of OR on organizational efficiency and resource optimization/</li> </ul>	
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. Use of Power point projection system.</li> <li>b. Video <a href="https://www.youtube.com/watch?v=NJLWW6K1oz4">https://www.youtube.com/watch?v=NJLWW6K1oz4</a> <a href="https://www.youtube.com/watch?v=3390-IYcLiQ">https://www.youtube.com/watch?v=3390-IYcLiQ</a> <a href="https://www.youtube.com/watch?v=0oMvVx81kCs">https://www.youtube.com/watch?v=0oMvVx81kCs</a></li> </ul>	
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (5 minutes) Ask questions What do you know about Operations Research? Do you know the companies plan their operations?</li> <li>2. <b>Development</b> (25 minutes) -Why this course is going to be taught. -Famous success stories: How the military used OR in WWII How OR helps Google optimize search rankings How OR helps companies like Uber and FedEx  -What would happen if there were no optimization techniques in business?" -"How would you manage a city's transportation system with limited resources?" -"What industries do you think rely most on OR?" -"Can you think of a decision-making problem where intuition is better than OR?" -Discussion on Assessment and Evaluation of the course</li> <li>3. <b>Exercise</b> (5 minutes) – Ask students to guess how OR is applied in their daily lives (e.g., online shopping, sports scheduling, traffic management).</li> </ol>	
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>2. Discuss the Analytical Questions from the Syllabus.</li> <li>3. Suggested Reading Operations Research By S Kalavathy. Spend 5 minutes to wrap up and consolidate the learning.</li> </ol>	



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**Lesson Plan**

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**Evaluation**

1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.  
Spend 5 minutes to evaluate student assimilation of the lesson contents

<b>Lesson Plan No. 1</b>	<b>Course Name: Operations Research</b>	<b>Course No.: MBA-203</b>
	<b>Topic: Introduction to Operations Research</b>	

<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Operations Research</li> <li>Understand the importance and integration of Operations Research for Business decision making.</li> <li>Discuss the concept of Operations Research.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Use of Power point projection system.</li> <li>Video <a href="https://www.youtube.com/@introductiontooperationsre4975">https://www.youtube.com/@introductiontooperationsre4975</a></li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction (5 minutes)</b> <ul style="list-style-type: none"> <li>Ask questions What do you know about Operations Research?  Explain Operations Research / Management Science.</li> <li>Discuss importance of Operations Research as a tool for Decision Making.</li> <li>Introduce the formal definition of Operations Research.</li> </ul> </li> <li><b>Development (25 minutes)</b> <ol style="list-style-type: none"> <li>Operations Research in the eyes of various Scientists and Management experts.               <ul style="list-style-type: none"> <li>Highlight the important characteristics and how it is a useful tool for decision making.</li> <li>Various definitions.</li> <li>Scope of Operations Research.</li> <li>Phases of Management Science.</li> <li>Advantages of Models of Management Science.</li> </ul> </li> <li>Application of operations research.               <ul style="list-style-type: none"> <li>Discuss Models on operations Research &amp; significant advantages.</li> <li>Examine characterizes of a good Model.</li> <li>Opportunities in Operations Science approach.</li> <li>Limitations of Operations Science approach.</li> </ul> </li> <li>Exercise (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol> </li> </ol>

<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>2. Discuss the Analytical Questions from the Syllabus.</li> <li>3. Suggested Reading Operations Research By S Kalavathy.</li> <li>4. <a href="https://www.bbau.ac.in/dept/UIET/EME-601%20Operation%20Research.pdf">https://www.bbau.ac.in/dept/UIET/EME-601%20Operation%20Research.pdf</a></li> <li>5. <a href="https://mdu.ac.in/UpFiles/UpPdfFiles/2021/Jun/4_06-11-2021_16-06-34_OPERATIONS%20RESEARCH%20TECHNIQUES(20MAT22C5).pdf">https://mdu.ac.in/UpFiles/UpPdfFiles/2021/Jun/4_06-11-2021_16-06-34_OPERATIONS%20RESEARCH%20TECHNIQUES(20MAT22C5).pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learning.</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

<b>Lesson Plan No. 2</b>	<b>Course Name: Operations Research</b> <b>Topic: Introduction to Operations Research</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. Articulate the concept of Decision making.</li> <li>b. Understand the importance of changing environments in decision making.</li> <li>c. Analyze the methodology of decision making.</li> </ul>
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. Use of Power point projection system.</li> <li>b. White Board</li> </ul>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (05 minutes) <ul style="list-style-type: none"> <li>• Ask questions from previous day lecture</li> <li>• Ask questions on changing environments.</li> </ul> Facing challenges of changing environments as a Decision maker. The importance of education, experience and leadership qualities for a decision maker. </li> <li>2. <b>Development</b> (25 minutes) <ol style="list-style-type: none"> <li>a. Decision making situations. <ul style="list-style-type: none"> <li>- Decision making under Certainty, Uncertainty, Risk and Conflict.</li> <li>b. Decision making Criteria under uncertainty. <ul style="list-style-type: none"> <li>- Maxi-max Criterion.</li> <li>- Maxi-min Criterion.</li> <li>- Mini-max Criterion.</li> <li>- Laplace Criterion.</li> <li>- Harwitz alpha Criterion.</li> </ul> </li> </ul> </li> <li>c. Solve cases under above Criteria. ( Numericals)</li> <li>d. Exercise (5 minutes) <ul style="list-style-type: none"> <li>- Conduct Quiz by asking questions while solving cases and discuss.</li> </ul> </li> </ol> </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>2. Discuss the University Questions from the Syllabus.</li> <li>3. Give Numerical as home task.</li> <li>4. Suggested Reading Operations Research By PP Pai. Quantitative Techniques in Mgt by ND Vohra.</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> </ol>



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	Spend 5 minutes to evaluate student assimilation of the lesson contents
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**Lesson Plan No. 3**
**Course Name: Operations Research**  
**Topic: Decision making under risk**
**Course No.: MBA-203**

<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept risk in Decision making.</li> <li>Understand the challenges posed by taking risk in decision making.</li> <li>Analyse the methodology of decision making under risk.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Use of Power point projection system.</li> <li>Board</li> <li>Discussion and Live Examples</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (5 minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous day lecture</li> <li>Ask questions on conditions of risk, profit &amp; opportunity Loss conditions.</li> </ul>           Importance of obtaining perfect information.         </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Expected monetary value under conditions of risk.               <ul style="list-style-type: none"> <li>Solve a sample case.</li> </ul> </li> <li>Expected opportunity loss under conditions of risk.               <ul style="list-style-type: none"> <li>Solve a sample case.</li> </ul> </li> <li>Expected value with perfect information under conditions of risk.               <ul style="list-style-type: none"> <li>Solve a sample case.</li> </ul> </li> <li>Expected value of perfect information under conditions of risk.               <ul style="list-style-type: none"> <li>Solve a sample case.</li> </ul> </li> </ol> </li> <li><b>Exercise</b> (5 minutes)           <ul style="list-style-type: none"> <li>Conduct Quiz by asking questions while solving cases and discuss.</li> </ul> </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Give Numerical as home task.</li> <li>Suggested Reading            Operations Research By PP Pai.            Quantitative Techniques in Mgt by ND Vohra.</li> <li><a href="https://mdu.ac.in/UpFiles/UpPdfFiles/2021/Jun/4_06-11-2021_16-0634_OPERATIONS%20RESEARCH%20TECHNIQUES(20MAT22C5).pdf">https://mdu.ac.in/UpFiles/UpPdfFiles/2021/Jun/4_06-11-2021_16-0634_OPERATIONS%20RESEARCH%20TECHNIQUES(20MAT22C5).pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

<b>Lesson Plan No. 4</b>	<b>Course Name: Operations Research</b> <b>Topic: Decision making under risk</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Articulate the concept risk in Decision making. b. Understand the challenges posed by taking risk in decision making. c. Analyze the methodology of decision making under risk.
<b>Teaching Aids (if any)</b>	a. Use of Power point projection system. b. White Board c. Discussion d. Live examples and problem Solving
<b>Teaching Development</b>	1. <b>Introduction</b> (05 minutes) <ul style="list-style-type: none"> <li>• Ask questions from previous day lecture</li> <li>• Ask questions on conditions of risk, profit &amp; opportunity Loss conditions &amp; EV with / of perfect information.</li> <li>• Ask one sample case to be solved by students.</li> </ul> 2. <b>Development</b> (25 minutes) <ol style="list-style-type: none"> <li>a. Discuss methodology to generate a conditional profit table.           <ul style="list-style-type: none"> <li>• Solve a sample case.</li> </ul> </li> <li>b. Discuss methodology to generate a conditional opportunity loss table.           <ul style="list-style-type: none"> <li>• Solve a sample case.</li> </ul> </li> <li>c. Expected monetary value under conditions of risk.           <ul style="list-style-type: none"> <li>- Solve a sample case for EMV, EOL &amp; EVPV..</li> </ul> </li> </ol> 3. <b>Exercise</b> (5 minutes) <ul style="list-style-type: none"> <li>- Conduct Quiz by asking questions while solving cases and discuss.</li> </ul>
<b>Closure</b>	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Give Numericals for home practice. 3. Suggested Reading Operations Research By PP Pai. Quantitative Techniques in Mgt by ND Vohra,  Spend 5 minutes to wrap up and consolidate the learnings
<b>Evaluation</b>	1. Reflective Questions (What, Why, How?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

<b>Lesson Plan No.</b> 5	<b>Course Name: Operations Research</b> <b>Topic: Decision making under risk, Numericals</b>	<b>Course No.: MBA-203</b>
<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept risk in Decision making.</li> <li>Understand the challenges posed by taking risk in decision making.</li> <li>Additional practice on decision making under risk.</li> </ol>	
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Use of Power point projection system.</li> <li>Problem Solving</li> </ol>	
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction (05 minutes)</b> <ul style="list-style-type: none"> <li>Ask questions from previous day lecture</li> <li>Ask questions on conditions of risk, profit &amp; opportunity Loss conditions &amp; EV with / of perfect information.</li> <li>Ask one sample case to be solved by students.</li> </ul> </li> <li><b>Development (25 minutes)</b> <ol style="list-style-type: none"> <li>Solve case to generate a conditional profit table and recommend decision based on EMV.</li> <li>Solve case to generate a conditional profit table and recommend decision based on EOL.</li> <li>Solve case to generate a conditional profit table and compare decision based on EMV, EOL &amp; EVPI.</li> </ol> </li> <li><b>Exercise (5 minutes)</b> Conduct Quiz by asking questions while solving cases and discuss.</li> </ol>	
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Discuss the Analytical Questions from the Syllabus.</li> <li>Give Numerical for practice.</li> <li>Suggested Reading Operations Research By PP Pai. Quantitative Techniques in Mgt by ND Vohra,</li> </ol> <p>Spent 5 minutes to wrap up and consolidate the learnings</p>	
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss. Spent 5 minutes to evaluate student assimilation of the lesson contents</li> </ol>	

<b>Lesson Plan No. 6</b>	<b>Course Name: Operations Research</b> <b>Topic: Decision making under Conflict</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of conflict in Decision making.</li> <li>Understand competitive conditions involving conflict.</li> <li>Analyze the challenges for taking decisions under conditions of conflict.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Use of Power point projection system.</li> <li>Board</li> <li>Discussion</li> <li>Live Examples</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (5 minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous day lecture</li> <li>Ask questions on competitive conditions involving conflict.</li> <li>Ask questions on conflicting situations in different sectors.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Discuss special features of conflicting situations.</li> <li>Discuss sample cases.</li> <li>Discuss methodology for taking decisions under the conditions of conflict.               <ul style="list-style-type: none"> <li>– Prior analysis.                   <ul style="list-style-type: none"> <li>• Pre Posterior analysis.</li> <li>• Posterior analysis.</li> </ul> </li> </ul> </li> </ol> </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Suggested Reading           <ul style="list-style-type: none"> <li>Quantitative Techniques in Mgt by ND Vohra,</li> <li><a href="https://mdu.ac.in/UpFiles/UpPdfFiles/2021/Jun/4_06-11-2021_16-0634_OPERATIONS%20RESEARCH%20TECHNIQUES(20MAT22C5).pdf">https://mdu.ac.in/UpFiles/UpPdfFiles/2021/Jun/4_06-11-2021_16-0634_OPERATIONS%20RESEARCH%20TECHNIQUES(20MAT22C5).pdf</a></li> </ul>           Spend 5 minutes to wrap up and consolidate the learnings         </li> </ol>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents</li> </ol>

<b>Lesson Plan No. 7</b>	<b>Course Name: Operations Research</b> <b>Topic: Multi stage Decision making.</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. Articulate the concept of multistage Decision making.</li> <li>b. Understand the procedure for laying a decision tree using different symbols and then wrapping it for taking decision.</li> <li>c. Analyze different steps in developing decision tree and values thereof to assimilate results and arrive at final decision.</li> </ul>
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. Use of Power point projection system.</li> <li>b. Board</li> <li>c. Video <a href="https://www.youtube.com/watch?v=yJf96EPBNz4">https://www.youtube.com/watch?v=yJf96EPBNz4</a></li> </ul>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (05 minutes) <ul style="list-style-type: none"> <li>-Ask questions from previous day lecture</li> <li>-Ask questions / discuss on issues involved in multistage problems and decisions to be taken.</li> <li>-Discuss one sample case.</li> </ul> </li> <li>2. <b>Development</b> (25 minutes) <ul style="list-style-type: none"> <li>- Discuss symbols used in developing a decision tree.</li> <li>- Solve a sample case (Numerical) by developing an appropriate tree by marking expenditures, market conditions, profit /loss values (outcomes) and then analyze outcomes at different stages, so as to finally arrive at the apt solution.</li> </ul> </li> <li>3. <b>Exercise</b> (5 minutes) <ul style="list-style-type: none"> <li>- Conduct Quiz by asking questions while solving case and discuss.</li> </ul> </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>2. Give a Numerical for practice.</li> <li>3. Suggested Reading Operations Research By S Kalavathy.</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

<b>Lesson Plan No. 8</b>	<b>Course Name: Operations Research</b> <b>Topic: Multi stage Decision making.</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Articulate the concept of multistage Decision making. b. Understand the procedure for laying a decision tree using different symbols and then wrapping it for taking decision. c. Analyze different steps in developing decision tree and values there of to assimilate results and arrive at final decision.
<b>Teaching Aids (if any)</b>	a. Use of Power point projection system. b. Problem Solving using Board c. Real life examples
<b>Teaching Development</b>	1. <b>Introduction</b> (05 minutes) <ul style="list-style-type: none"> <li>• Ask questions from previous day lecture</li> <li>• Ask questions / discuss on issues involved in multistage problems and decisions to be taken.</li> <li>• Discuss one sample case.</li> </ul> 2. <b>Development</b> (25 minutes) a. Read the case in detail, identify various stages and parameters to draw a Decision tree. b. Solve the sample case (Numerical) by developing an appropriate tree by marking expenditures, market conditions, profit /loss values (outcomes) and then analyze outcomes at different stages, so as to finally arrive at the apt solution. 3. <b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions while solving case and discuss.
<b>Closure</b>	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Give a Numerical for practice. 3. Suggested Reading Quantitative Techniques By ND Vohra.  Spend 5 minutes to wrap up and consolidate the learnings
<b>Evaluation</b>	1. Reflective Questions (What, Why, How?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

<b>Lesson Plan No. 9</b>	<b>Course Name: Operations Research</b> <b>Topic: Transportation Problem</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Transportation in Linear Programming.</li> <li>Understand the importance of Transportation to deal with logistics i.e. shifting of commodities from multiple origins to multiple destinations at minimum cost.</li> <li>Learn the technique / methodology and intricacies arising in transportation problem.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Use of Power point projection system.</li> <li>Use Board</li> <li>Live example from industry.</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Discuss transportation scenarios and problems thereof.</li> <li>Various terminologies used in transportation, demand, supply, Rim conditions, Balancing demand &amp; supply.</li> <li>Transportation procedure.</li> <li>Discuss various conditions like market short supply and Market flooding etc.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Discuss special features of transportation.</li> <li>Discuss the steps to solve the Problem</li> <li>Formulate the mathematical model &amp; the transportation table.</li> <li>Discuss various conditions / definitions.               <ul style="list-style-type: none"> <li>Feasible solution.</li> <li>Basic feasible solution.</li> <li>Non degenerate basic feasible solution.</li> <li>Degenerate basic feasible solution.</li> </ul> </li> <li>What are the applications of transportation problems?               <ol style="list-style-type: none"> <li>Solve a sample case.</li> </ol> </li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Suggested Reading           <ul style="list-style-type: none"> <li>Operations Research By S Kalavathy.</li> <li><a href="https://www.bbau.ac.in/dept/UIET/EME-601%20Operation%20Research.pdf">https://www.bbau.ac.in/dept/UIET/EME-601%20Operation%20Research.pdf</a></li> <li><a href="https://kanchiuniv.ac.in/coursematerials/transportationproblem.pdf">https://kanchiuniv.ac.in/coursematerials/transportationproblem.pdf</a></li> </ul> </li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>

<b>Evaluation</b>	1. Reflective Questions (What, Why, How?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

<b>Lesson Plan No. 10</b>	<b>Course Name: Operations Research</b> <b>Topic: Transportation Problem</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	<p>At the end of the lesson the student shall be able to:</p> <ol style="list-style-type: none"> <li>Articulate the concept of Transportation in Linear Programming.</li> <li>Understand the importance of Transportation to deal with logistics i.e. shifting of commodities from multiple origins to multiple destinations at minimum cost.</li> <li>Learn the technique / methodology and intricacies arising in Transportation problem.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Use of Power point projection system.</li> <li>Use of Board.</li> <li>Live examples of industry</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)       <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Discuss a sample case for Basic feasible solution.</li> <li>Various terminologies used in transportation, demand, supply, Rim conditions, Balancing demand &amp; supply.</li> <li>Transportation procedure.</li> </ul> </li> <li><b>Development</b> (25 minutes)       <ol style="list-style-type: none"> <li>Discuss various methodologies for working Basic Feasible Solution.- A feasible solution is called a basic feasible solution if it contains not more than <math>m+n-1</math> allocations, where <math>m</math> is the number of rows and <math>n</math> is the number of columns in a transportation problem           <ol style="list-style-type: none"> <li>Formulate a mathematical model &amp; transportation table. Make allocations for transportation by Inspection method, North- West corner rule- North-west corner rule or method is used to find the initial basic feasible solution to a transportation problem so that the total cost of transportation is minimized. and Vogel,s Approximation method (VAM) methodologies.</li> <li>Satisfy conditions for Basic feasible solution i.e. Balanced Demand &amp; Supply, Rim conditions satisfied, all allocations independently located and are equal to <math>m+n-1</math>.</li> </ol> </li> </ol> </li> </ol>

	<p>d.Solve a case using above methodologies.</p> <p>3. Exercise (5 minutes) –          Conduct Quiz by asking questions and discuss.</p>
<b>Closure</b>	<p>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</p> <p>2. Assign one case as home assignment.</p> <p>3. Suggested Reading          Operations Research By S Kalavathy.          Quantitative Methods in Management by ND Vohra,  <a href="https://egyankosh.ac.in/bitstream/123456789/20787/1/Unit-4.pdf">https://egyankosh.ac.in/bitstream/123456789/20787/1/Unit-4.pdf</a></p> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<p>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.          Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

<b>Lesson Plan No. 11</b>	<b>Course Name: Operations Research</b> <b>Topic: Transportation Problem</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. Articulate the concept of Transportation in Linear Programming.</li> <li>b. Understand the importance of Transportation to deal with logistics i.e. shifting of commodities from multiple origins to multiple destinations at minimum cost.</li> <li>c. Learn the technique / methodology and intricacies arising in transportation problem.</li> </ul>
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. Use of Power point projection system.</li> <li>b. Use of Board</li> <li>c. Live example</li> </ul>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (05 minutes) <ul style="list-style-type: none"> <li>- Ask questions from the previous lecture.</li> <li>- Discuss transportation scenarios and problems thereof.</li> <li>- Various terminologies used in transportation, demand, supply, Rim conditions, Balancing demand &amp; supply.</li> <li>- The drawbacks in the stepping stone procedure for optimality.</li> </ul> </li> <li>1. <b>Development</b> (25 minutes) <ul style="list-style-type: none"> <li>- Formulate the mathematical model &amp; a transportation table using N-W Corner Rule or VAM.</li> <li>- Discuss Modified Distribution (MODI) procedure to check optimality of present solution.</li> <li>- What is the modified distribution method in transportation?</li> <li>- MODI method is an improvement over stepping stone method. This model studies the minimization of the cost of transporting a commodity from a number of sources to several destinations. The supply at each source and the demand at each destination are known</li> <li>- Solve a sample case by examining, opportunities for improvement/reduction in transportation cost, shifting allocations and arriving at the optimal solution through Iterations.</li> </ul> </li> <li>3 <b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>2. Assign a numerical as home assignment.</li> <li>3. Suggested Reading Quantitative technique in management by ND Vohra. Spend 5 minutes to wrap up and consolidate the learnings.</li> </ol>

**Evaluation**

1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.  
Spend 5 minutes to evaluate student assimilation of the lesson contents

**Lesson Plan No. 12**
**Course Name: Operations Research**  
**Topic: Transportation Problem**
**Course No.: MBA-203**

<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Transportation in Linear Programming.</li> <li>Understand the importance of Transportation to deal with logistics i.e. shifting of commodities from multiple origins to multiple destinations at minimum cost.</li> <li>Learn the technique / methodology and intricacies arising in transportation problem.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Use of Power point projection system.</li> <li>Use of Board</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>-Ask questions from the previous lecture.</li> <li>-Discuss transportation scenarios and problems thereof.</li> <li>-Number of allocations should be equal to <math>m+n-1</math>.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ul style="list-style-type: none"> <li>- Formulate the mathematical model &amp; a transportation table and make allocations using N-W Corner Rule or VAM- Vogel's Approximation Method (VAM) is an iterative procedure used to calculate the initial feasible solution to a transportation problem. The goal of VAM is to minimize the total cost. This method involves finding the penalties for each available row and column by considering the least and second least cost.</li> <li>- Check for conditions i.e. Rim conditions, allocations at independent location and number of allocations equal to <math>m+n-1</math>.</li> <li>- If number of allocations are less than <math>m+n-1</math>, then there is degeneracy in the system.</li> <li>- Solve a sample case by examining the allocations and using technique to remove degeneracy before applying MODI.</li> </ul> </li> <li>Exercise (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign a numerical as home assignment.</li> <li>Suggested Reading Operation Research by S Kalavathy. Quantitative technique in management by ND Vohra. <a href="https://theengineeringmaths.com/wp-content/uploads/2017/04/transportation.pdf">https://theengineeringmaths.com/wp-content/uploads/2017/04/transportation.pdf</a> Spend 5 minutes to wrap up and consolidate the learnings.</li> </ol>

**Evaluation**

1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.  
Spend 5 minutes to evaluate student assimilation of the lesson contents

<b>Lesson Plan No. 13</b>	<b>Course Name: Operations Research</b> <b>Topic: Assignment Problem</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Assignment in Linear Programming.</li> <li>Understand the importance of Assignment to deal with use of appropriate work force on the available Jobs, so as to minimize the time, effort, cost etc.</li> <li>Learn the technique / methodology and intricacies arising in Assignment problem.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Use of Power point projection system.</li> <li>Use of Board</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>-Discuss Assignment scenarios and problems thereof.</li> <li>-Discuss difference between the Transportation and Assignment problems.</li> <li>-Discuss Hungarian method &amp; procedure to make assignments.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ul style="list-style-type: none"> <li>- What is assignment problem in operation research- Assignment Problem is a special type of linear programming problem where the objective is to minimise the cost or time of completing a number of jobs by a number of persons. Discuss special features of an Assignment model.</li> <li>-Proceed with the Hungarian methodology step by step to arrive at the Job allocations- Hungarian method is a computational optimization technique that addresses the assignment problem in polynomial time and foreshadows following primal-dual alternatives. In 1955, Harold Kuhn used the term “Hungarian method” to honour two Hungarian mathematicians, Dénes Kőnig and Jenő Egerváry</li> <li>-Work out the assignment cost.</li> <li>-Solve a sample case.</li> </ul> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li><b>Suggested Reading</b> Operations Research By S kalavathy. Quantitative Techniques in Management by ND Vohra. <a href="https://egyankosh.ac.in/bitstream/123456789/20790/1/Unit-5.pdf">https://egyankosh.ac.in/bitstream/123456789/20790/1/Unit-5.pdf</a> Spend 5 minutes to wrap up and consolidate the learnings</li> </ol>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents</li> </ol>



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**Lesson Plan No. 14**
**Course Name: Operations Research  
 Topic: Assignment Problem**
**Course No.: MBA-203**

<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Assignment in Linear Programming.</li> <li>Understand the importance of Assignment to deal with use of appropriate work force on the available Jobs, so as to minimize the time, effort, cost etc.</li> <li>Learn the technique / methodology and intricacies arising in Assignment problem.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Use of Power point projection system.</li> <li>Use of Board</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>-Ask questions &amp; doubts from the previous lecture.</li> <li>-Discuss unbalanced cases.</li> <li>-Discuss maximization cases.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Square the matrix by adding dummy row or column of zero value to balance the cost matrix.</li> <li>Deduct all elements of the matrix from the highest element to convert the given profit matrix into loss matrix.</li> <li>Proceed with the Hungarian methodology step by step to arrive at the Job allocations.</li> <li>Work out the assignment cost using original cost values of the profit matrix.</li> <li>Solve a sample case.</li> </ol> </li> <li>Exercise (5 minutes) –           <ul style="list-style-type: none"> <li>Conduct Quiz by asking questions and discuss.</li> <li>One minute paper pen activity</li> </ul> </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign one numerical as home task.</li> <li>Suggested Reading            Operations Research By S kalavathy.            Quantitative Techniques in Management by ND Vohra.  <a href="https://kanchiuniv.ac.in/coursematerials/OperationResearch.pdf">https://kanchiuniv.ac.in/coursematerials/OperationResearch.pdf</a> </li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.            Spend 5 minutes to evaluate student assimilation of the lesson contents</li> </ol>



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# Model Institute of Engineering & Technology (Autonomous) Lesson Plan



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<b>Lesson Plan No. 15</b>	<b>Course Name: Operations Research</b> <b>Topic: Assignment Problem</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Assignment in Linear Programming.</li> <li>Understand the importance of Assignment to deal with use of appropriate work force on the available Jobs, so as to minimise the time, effort, cost etc.</li> <li>Learn the technique / methodology and intricacies arising in Assignment problem.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Discussion</li> <li>Live examples</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Ask questions &amp; doubts from the previous lecture.</li> <li>Discuss the restricted routes and restricted space / area scenario.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ul style="list-style-type: none"> <li>-Allot very high values like infinity to the restricted slots in the cost matrix, to avoid allocations in the solution.</li> <li>-Proceed with the Hungarian methodology step by step to arrive at the Job allocations.</li> <li>-Work out the assignment cost using the given cost matrix.</li> <li>-Solve a sample case.</li> </ul> </li> <li><b>Exercise</b> (5 minutes) –           <ul style="list-style-type: none"> <li>Conduct Quiz by asking questions and discuss.</li> </ul> </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign one numerical as home task.</li> <li>Suggested Reading Operations Research By VK Kapoor.</li> <li><a href="https://gacbe.ac.in/pdf/ematerial/18BST54C-U4.pdf">https://gacbe.ac.in/pdf/ematerial/18BST54C-U4.pdf</a></li> <li><a href="https://kanchiuniv.ac.in/coursematerials/OperationResearch.pdf">https://kanchiuniv.ac.in/coursematerials/OperationResearch.pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

<b>Lesson Plan No. 16</b>	<b>Course Name: Operations Research</b> <b>Topic: Assignment Problem</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Travelling Salesman in the Linear Programming.</li> <li>Understand the route to be followed by the Travelling Salesman before reaching home after visiting each city / place once.</li> <li>Learn the technique / methodology and intricacies arising in solving Travelling Salesman problem.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>Use of Power point projection system.</li> <li>Use of Board</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>-Ask questions &amp; doubts from the previous lecture.</li> <li>-Discuss the routes to be followed by the Travelling Salesman (The traveling salesman problem (TSP) is an algorithmic problem tasked with finding the shortest route between a set of points and locations that must be visited. In the problem statement, the points are the cities a salesperson might visit. )for visiting each city once, and restrictions applied, if any,</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ul style="list-style-type: none"> <li>- Analyze the given cost matrix using the Hungarian methodology step by step and arrive at the city allocations.</li> <li>-Work out alternate routes, if and as applicable.</li> <li>-Work out the total distance involved using the given cost matrix.</li> </ul>           Solve a sample case.         </li> <li><b>Exercise</b> (5 minutes) –           <ul style="list-style-type: none"> <li>Conduct Quiz by asking questions and discuss.</li> </ul> </li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign one numerical as home task.</li> <li>Suggested Reading Operations Research By VK Kapoor. Spend 5 minutes to wrap up and consolidate the learnings <a href="http://www.math.harvard.edu/archive/20_spring_05/handouts/assignment_overheads.pdf">http://www.math.harvard.edu/archive/20_spring_05/handouts/assignment_overheads.pdf</a> , <a href="https://ocw.ehu.eus/pluginfile.php/40935/mod_resource/content/1/5_Transportation.pdf">https://ocw.ehu.eus/pluginfile.php/40935/mod_resource/content/1/5_Transportation.pdf</a></li> </ol>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents</li> </ol>

<b>Lesson Plan No. 17</b>	<b>Course Name: Operations Research</b> <b>Topic: Linear Programming Problem-Formulation and Graphical Method</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Articulate the concept of Linear Programming Problem. b. Understand the importance of LPP c. Learn the methodology to use graphical method to solve different kind of problems
<b>Teaching Aids (if any)</b>	a. White Board b. Live Examples c. Problem Solving
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Do you know about the concept of LPP?</li> <li>Discuss the Concept of Linear Programming Problem</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ul style="list-style-type: none"> <li>-Discuss assumptions and requirements of LPP                Conditions of Certainty. It means that numbers in the objective and constraints are known with certainty and do change during the period being studied.                Linearity or Proportionality. ...                Additivity. ...                Divisibility. ...                Non-negative variable. ...                Finiteness. ...                Optimality</li> <li>- Formulate the mathematical model.                A Linear Programming model is a mathematical programming model in which • the objective function is a linear expression of the decision variables; • the constraints are given by a system of linear equations and/or inequalities</li> <li>- Discuss various graphical methods to solve mathematical problems               <ul style="list-style-type: none"> <li>- Feasible solution.</li> <li>- Basic feasible solution.</li> <li>- Solve a sample case.</li> </ul> </li> </ul> </li> <li>Exercise (5 minutes) –                Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Suggested Reading                Operations Research By N.D. Vohra.  <a href="https://www.geeksforgeeks.org/graphical-solution-of-linear-programming-problems/">https://www.geeksforgeeks.org/graphical-solution-of-linear-programming-problems/</a></li> </ol>

	<p><a href="https://www.shivajicollege.ac.in/sPanel/uploads/econtent/6a29108e77c81984475a9fa161b83f92.pdf">https://www.shivajicollege.ac.in/sPanel/uploads/econtent/6a29108e77c81984475a9fa161b83f92.pdf</a></p> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<p>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</p> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

**Lesson Plan No. 18**
**Course Name: Operations Research**  
**Topic: Graphical Method**
**Course No.: MBA-203**

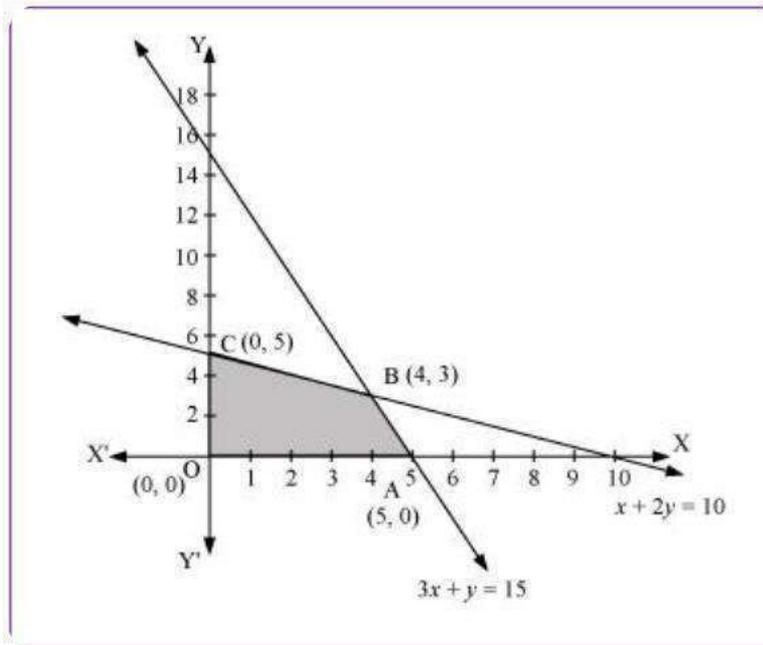
<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Understand the Maximization problem in LP b. Understand the Minimum problem in LP
<b>Teaching Aids (if any)</b>	a. White Board b. Discussion
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>- Do you know about the Maximization Problem?</li> <li>- Discuss the Concept of Maximization Problem</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ul style="list-style-type: none"> <li>-Discuss methodology to solve Maximization problem.</li> <li>Write the objective function.</li> <li>Write the constraints. ...</li> <li>Graph the constraints.</li> <li>Shade the feasibility region.</li> <li>Find the corner points.</li> <li>Determine the corner point that gives the maximum value.- A corner point of a feasible region is a point in the region which is the intersection of two boundary lines</li> <li>- Draw the graph to solve maximization problems</li> <li>- Discuss less than or equal to constraints to solve the Problems</li> </ul> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Suggested Reading Operations Research By N.D. Vohra.</li> <li><a href="https://www.shivajicollege.ac.in/sPanel/uploads/econtent/6a29108e77c81984475a9fa161b83f92.pdf">https://www.shivajicollege.ac.in/sPanel/uploads/econtent/6a29108e77c81984475a9fa161b83f92.pdf</a></li> <li><a href="https://www.geeksforgeeks.org/graphical-solution-of-linear-programming-problems/">https://www.geeksforgeeks.org/graphical-solution-of-linear-programming-problems/</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>

**Evaluation**

1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.  
Spend 5 minutes to evaluate student assimilation of the lesson contents

**Lesson Plan No. 19**
**Course Name: Operations Research**  
**Topic: Graphical Method continued.**
**Course No.: MBA-203**

<b>Objectives</b>	At the end of the lesson the student shall be able to: a. Understand the concept of Unbounded and Infeasible solutions b. Understand the More than or Equal to constraints problems
<b>Teaching Aids (if any)</b>	a. Board b. Discussion c. Problem Solving
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Do you know about the Unbounded Problem?</li> <li>Discuss the Concept of Unbounded Problem</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ul style="list-style-type: none"> <li>-Discuss methodology to solve Unbounded Problem.</li> <li>-Draw the graph to solve Unbounded problems</li> <li>-Discuss the differences between unbounded and infeasible solutions.- An infeasible problem is a problem that has no solution while an unbounded problem is one where the constraints do not restrict the objective function and the objective goes to infinity. Both situations often arise due to errors or shortcomings in the formulation or in the data defining the problem.</li> </ul> </li> <li>Exercise (5 minutes) –            Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Suggested Reading            Operations Research By N.D. Vohra.</li> <li><a href="http://www.markschulze.net/LinearProgramming.pdf">http://www.markschulze.net/LinearProgramming.pdf</a> ,</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> <li>Quiz</li> </ol>



Maximise  $Z = 3x + 2y$  from the following graph

- A. Maximum value of  $Z$  is 10
- B. Maximum value of  $Z$  is 20
- C. Maximum value of  $Z$  is 15
- D. **Maximum value of  $Z$  is 18**

Spend 5 minutes to evaluate student assimilation of the lesson contents

<b>Lesson Plan No. 20</b>	<b>Course Name: Operations Research</b> <b>Topic: Simplex Method</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Understand the concept of Simplex Method</li> <li>Understand the concept of Maximization problem using simplex method</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Do you know about Simplex method?</li> <li>Discuss the Concept of Simplex method</li> <li>Basic variables:               <ul style="list-style-type: none"> <li>Are the variables which coefficients One in the equations and Zero in the other equations.</li> <li>Non-Basic variables:                   <ul style="list-style-type: none"> <li>Are the variables which coefficients are taking any of the values, whether positive or negative or zero.</li> </ul> </li> <li>Slack, surplus &amp; artificial variables:                   <ol style="list-style-type: none"> <li>If the inequality be (less than or equal, then we add a slack variable + S to change to =.</li> <li>If the inequality be (greater than or equal, then we subtract a surplus variable - S to change to =. If we have = we use artificial variables.</li> </ol> </li> </ul> </li> </ul> </li> <li><b>Development</b> (25 minutes)</li> <li>-Discuss methodology to solve problems using simplex method. The Simplex method is an approach for determining the optimal value of a linear program by hand. The method produces an optimal solution to satisfy the given constraints and produce a maximum zeta value. - -Discuss about the Minimum ratio and opportunity cost - Discuss the methodology for optimum solution</li> <li>Exercise (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Suggested Reading Operations Research By N.D. Vohra.</li> <li><a href="http://web.mit.edu/15.053/www/AMP-Chapter-02.pdf">http://web.mit.edu/15.053/www/AMP-Chapter-02.pdf</a></li> <li><a href="https://www.shivajicollege.ac.in/sPanel/uploads/econtent/33dfc039a8d88fa01d763d5abcd1df20.pdf">https://www.shivajicollege.ac.in/sPanel/uploads/econtent/33dfc039a8d88fa01d763d5abcd1df20.pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>

**Evaluation**

1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.  
Spend 5 minutes to evaluate student assimilation of the lesson contents

<b>Lesson Plan No. 21</b>	<b>Course Name: Operations Research</b> <b>Topic: Simplex Method continued</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Understand the concept of Simplex Method</li> <li>Understand the concept of Minimise problem using simplex method</li> <li>Identify the key components of a Simplex tableau.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Discussion</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Do you know about Simplex method?</li> <li>Discuss the Concept of Simplex method</li> <li>Briefly introduce the concept of linear programming and its importance in optimization.</li> <li>Explain the need for the Simplex Method in solving linear programming problems.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Discuss methodology to solve problems using simplex method.</li> <li>Discuss about the Minimum ratio and opportunity cost</li> <li>Discuss the methodology for optimum solution</li> <li>Demonstration of the Simplex Method through a sample problem.</li> <li>Practice exercises for the students to solve using the Simplex Method.</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Suggested Reading Operations Research By N.D. Vohra. <a href="https://www.srcc.edu/sites/default/files/BCom(Hons)_2year_BMaths_1&amp;2_Harish%20Kumar.pdf">https://www.srcc.edu/sites/default/files/BCom(Hons)_2year_BMaths_1&amp;2_Harish%20Kumar.pdf</a> <a href="https://www.uobabylon.edu.iq/eprints/paper_3_1338_203.pdf">https://www.uobabylon.edu.iq/eprints/paper_3_1338_203.pdf</a> <a href="https://sites.math.washington.edu/~perkins/381AWin14/handouts/chapter3.pdf">https://sites.math.washington.edu/~perkins/381AWin14/handouts/chapter3.pdf</a>  Spend 5 minutes to wrap up and consolidate the learnings</li> </ol>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> <li>Quiz Question : -What is the primary purpose of the Simplex Method?</li> </ol>

	<p>-How is the optimality of a solution determined using the Simplex Method?</p> <p>-When is the Simplex Method not applicable to solve a linear programming -problem?</p> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>
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<b>Lesson Plan No. 22</b>	<b>Course Name: Operations Research</b> <b>Topic: Big M Method</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Understand the concept of BIG M Method</li> <li>Understand the importance of using Big M method</li> <li>Understand the methodology of Big M method</li> <li>Learn how to apply the Big M Method to solve linear programming problems</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Dissuasion</li> <li>Live examples form operations</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>- Do you know about Big M Method?</li> <li>- Discuss the Concept of Big M method</li> <li>- Define the Big M Method and its relevance in Operations Research</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Discuss methodology to solve problems using Big M method.</li> <li>Discuss about the Minimum ratio and opportunity cost</li> <li>Discuss the methodology for optimum solution</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Suggested Reading Operations Research By N.D. Vohra. <a href="http://people.brunel.ac.uk/~mastjjb/jeb/or/morelp.html">http://people.brunel.ac.uk/~mastjjb/jeb/or/morelp.html</a> <a href="https://uomustansiriyah.edu.iq/media/lectures/5/5_2020_10_03!11_11_31_AM.pdf">https://uomustansiriyah.edu.iq/media/lectures/5/5_2020_10_03!11_11_31_AM.pdf</a></li> </ol>

	<p><a href="https://www.nascollege.org/e%20cotent%2010-4-20/DR%20K%20K%20KANSAL/L%209%20Minimization%20The%20Big%20M%20Method%20M%20COM%2019-4.pdf">https://www.nascollege.org/e%20cotent%2010-4-20/DR%20K%20K%20KANSAL/L%209%20Minimization%20The%20Big%20M%20Method%20M%20COM%2019-4.pdf</a></p> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
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<b>Lesson Plan No. 23</b>	<b>Course Name: Operations Research</b> <b>Topic: Big M Method continued.</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Understand the concept of BIG M Method</li> <li>Understand the importance of using Big M method</li> <li>Understand the methodology of Big M method</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Discussion</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>- Do you know about Big M Method?</li> <li>- Discuss the Concept of Big M method</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Discuss methodology to solve problems using Big M method. Modify the constraints so that the RHS of each constraint is nonnegative (This requires that each constraint with a negative RHS be multiplied by -1. Remember that if you multiply an inequality by any negative number, the direction of the inequality is reversed!). After modification, identify each constraint as <math>\geq</math>, <math>\leq</math> or <math>=</math> constraint.</li> <li>Convert each inequality constraint to standard form .If constraint <math>i</math> is <math>\leq</math> constraint, we add a slack variable <math>s_i</math>; and if constraint <math>i</math> is <math>\geq</math> constraint, we subtract an excess (surplus) variable <math>e_i</math></li> <li>Add an artificial variable <math>a_i</math> to the constraints identified as <math>\geq</math> or <math>=</math> constraints at the end of Step 1. Also add the sign restriction <math>a_i \geq 0</math>.</li> <li>Let <math>M</math> denote a very large positive number. If the LP is a min problem, add (for each artificial variable) <math>M a_i</math> to the objective function (before equal to 0). If the LP is a max problem, add (for each artificial variable) <math>-M a_i</math> to the objective function (before equal to 0).</li> <li>Since each artificial variable will be in the starting basis, all artificial variables must be eliminated from objective row before beginning the simplex. Now solve the transformed problem by the simplex (In choosing the entering variable,</li> </ol> </li> </ol>

	<p>remember that M is a very large positive number!).</p> <p>b. Discuss about the Minimum ratio and opportunity cost</p> <p>c. Discuss the methodology for optimum solution</p> <p>3. Exercise (5 minutes) – Conduct Quiz by asking questions and discuss.</p>
<b>Closure</b>	<p>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</p> <p>2. Suggested Reading Operations Research By N.D. Vohra.</p> <ul style="list-style-type: none"> <li>- <a href="https://www.nascollege.org/e%20cotent%2010-4-20/DR%20K%20K%20KANSAL/L%209%20Minimization%20The%20Big%20M%20Method%20M%20COM%2019-4.pdf">https://www.nascollege.org/e%20cotent%2010-4-20/DR%20K%20K%20KANSAL/L%209%20Minimization%20The%20Big%20M%20Method%20M%20COM%2019-4.pdf</a></li> <li>- <a href="https://www.pmc calculators.com/big-m-method-calculator/">https://www.pmc calculators.com/big-m-method-calculator/</a></li> </ul> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<p>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</p> <p>2. Quiz Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

<b>Lesson Plan No. 24</b>	<b>Course Name: Operations Research</b> <b>Topic: Duality in Linear Programming</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Understand the concept of Duality in Linear Programming</li> <li>Understand the importance of Duality in LP</li> <li>Understand the formulation of Dual problems.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Discussion</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Do you know about Duality?</li> <li>Discuss the Concept of Duality in LPP</li> <li>Apply the concept of duality in their own writing</li> <li>Ask students if they have ever heard of the term "duality"</li> <li>Explain that duality refers to the presence of two contrasting or opposing elements in a work of literature.</li> <li>Provide examples of duality in literature, such as good vs. evil, love vs. hate, or light vs. dark</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Discuss the formulation of Dual Equation.               <ul style="list-style-type: none"> <li>Steps for formulation are summarised as Step 1: write the given LPP in its standard form. Step 2: identify the variables of dual problem which are same as the number of constraints equation. Step 3: write the objective function of the dual problem by using the constants of the right had side of the constraints.</li> </ul> </li> <li>What is the theorem of duality?</li> <li>Uses of Duality in Linear Programming</li> <li>Discuss the methodology to solve dual problem</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Suggested Reading Operations Research By N.D. Vohra.           <ul style="list-style-type: none"> <li><a href="https://udrc.lkouniv.ac.in/Content/DepartmentContent/SM_e3b642de-1629-4acc-b834-f8048a44e930_38.pdf">https://udrc.lkouniv.ac.in/Content/DepartmentContent/SM_e3b642de-1629-4acc-b834-f8048a44e930_38.pdf</a></li> <li><a href="https://web.mit.edu/15.053/www/AMP-Chapter-04.pdf">https://web.mit.edu/15.053/www/AMP-Chapter-04.pdf</a></li> <li><a href="https://www.reisanar.com/files/Primal_Dual.pdf">https://www.reisanar.com/files/Primal_Dual.pdf</a></li> </ul> </li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> </ol>

	<p>2. Quiz:</p> <ul style="list-style-type: none"><li>- What is duality in literature?</li><li>-Name one example of duality in literature</li><li>-How can duality contribute to the themes and messages of a work of literature?</li></ul> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>
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<b>Lesson Plan No. 25</b>	<b>Course Name: Operations Research</b> <b>Topic: Network Technique CPM &amp; PERT</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Networks in Linear Programming.</li> <li>Understand the importance of Networks towards planning &amp; scheduling of large projects.</li> <li>Learn the technique to minimise the criticalities like delays, interruptions and coordinate the activities to overcome these.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Discussion</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Introduce the networks concept.</li> <li>Discuss objectives and applications of networks.</li> <li>Discuss important rules to be followed in Networks.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Discuss and explain various terminologies using examples like Activity, Events and its types, Dummy activity, Dangler, Loop, Float, slack etc.</li> <li>Understand precedence system and connect activities accordingly.</li> <li>Draw basic and short networks to understand precedence, rules and use of Dummy.</li> <li>Solve a case using above methodologies.</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign one case as home assignment.</li> <li><b>Suggested Reading</b> <ul style="list-style-type: none"> <li>Operations Research By S kalavathy.</li> <li>Quantitative Methods in Management by ND Vohra,  <a href="https://www.studocu.com/in/document/pes-university/management----science-operations-research/pert-and-cpm-techniques/17727287">https://www.studocu.com/in/document/pes-university/management----science-operations-research/pert-and-cpm-techniques/17727287</a></li> <li><a href="https://www.srividyaengg.ac.in/coursematerial/CSE/104745.pdf">https://www.srividyaengg.ac.in/coursematerial/CSE/104745.pdf</a></li> </ul> </li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> <li>Quiz</li> </ol>



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	Spend 5 minutes to evaluate student assimilation of the lesson contents
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<b>Lesson Plan No. 26</b>	<b>Course Name: Operations Research</b> <b>Topic: Network Technique CPM &amp; PERT</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Networks in Linear Programming.</li> <li>Understand the importance of Networks towards planning &amp; scheduling of large projects.</li> <li>Learn the technique to minimise the criticalities like delays, interruptions and coordinate the activities to overcome these.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Discussion</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Introduce the networks concept.</li> <li>Discuss important rules to be followed in Networks and precedence Networks.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Discuss Network activities relationship.</li> <li>Discuss network construction methodology.               <ul style="list-style-type: none"> <li>Identify numbers of activities.</li> <li>Decide the logical order in which activities to be performed or executed.</li> <li>Fix predecessor and successor activities.</li> <li>Find out parallel activities. ( Dummy activities)</li> </ul> </li> <li>Draw basic and short networks to understand precedence, rules and use of Dummy.</li> <li>Solve two cases using above methodologies.</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign one case as home assignment.</li> <li>Suggested Reading           <ul style="list-style-type: none"> <li>Operations Research By S Kalavathy.</li> <li>Quantitative Methods in Management by ND Vohra,</li> <li><a href="http://www.sdcamzn.in/Images/DisclosureFile/PMNACPM.pdf">http://www.sdcamzn.in/Images/DisclosureFile/PMNACPM.pdf</a></li> </ul> </li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learning</p>

<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li><li>2. Quiz Spend 5 minutes to evaluate student assimilation of the lesson contents</li></ol>
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<b>Lesson Plan No. 27</b>	<b>Course Name: Operations Research</b> <b>Topic: Network Technique CPM &amp; PERT</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Networks in Linear Programming.</li> <li>Understand the importance of Networks towards planning &amp; scheduling of large projects.</li> <li>Learn the technique to minimise the criticalities like delays, interruptions and coordinate the activities to overcome these.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Discussion</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Introduce the single time estimate method CPM .</li> <li>Introduce Forward path &amp; Reverse path methodology.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Draw a project Network based on single time estimate.</li> <li>Discuss and analyse Forward path method to ascertain earliest start and earliest finish time of each activity in the network</li> <li>Discuss and analyse earliest occurrence time of each event in the network.</li> <li>Discuss and analyse reverse path method to ascertain the latest event time.</li> <li>Work out the project completion time.</li> <li>Solve a cases using above methodologies.</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign one case as home assignment.</li> <li>Suggested Reading Operations Research By PP Pai. Quantitative Methods in Management by ND Vohra, Spend 5 minutes to wrap up and consolidate the learning</li> </ol>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> <li>Quiz Spend 5 minutes to evaluate student assimilation of the lesson contents</li> </ol>



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Dr. Arun K. Gupta Teaching-Learning Centre

Version 1:1

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<b>Lesson Plan No. 28</b>	<b>Course Name: Operations Research</b> <b>Topic: Network Technique CPM &amp; PERT</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Networks in Linear Programming.</li> <li>Understand the importance of Networks towards planning &amp; scheduling of large projects.</li> <li>Learn the technique to minimise the criticalities like delays, interruptions and coordinate the activities to overcome these.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Discussion</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Revise the single time estimate method CPM.</li> <li>Revise the Forward path &amp; Reverse path methodology.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Draw a project Network based on single time estimate.</li> <li>Discuss and analyse Forward path method to ascertain earliest start and earliest finish time of each activity in the network</li> <li>Discuss and analyse earliest occurrence time of each event in the network.</li> <li>Discuss and analyse reverse path method to ascertain the latest event time.</li> <li>Work out the project completion time.</li> <li>Identify the critical activities, critical events and the critical path in the network.</li> <li>Solve a cases using above methodologies.</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign one case as home assignment.</li> <li>Suggested Reading Operations Research By PP Pai. Quantitative Methods in Management by ND Vohra, <a href="https://www.sridayaengg.ac.in/coursematerial/CSE/104745.pdf">https://www.sridayaengg.ac.in/coursematerial/CSE/104745.pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learning</p>

<b>Evaluation</b>	1. Reflective Questions (What, Why, How?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents
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<b>Lesson Plan No. 29</b>	<b>Course Name: Operations Research</b> <b>Topic: Network Technique CPM &amp; PERT</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Networks in Linear Programming.</li> <li>Understand the importance of Networks towards planning &amp; scheduling of large projects.</li> <li>Learn the technique to minimise the criticalities like delays, interruptions and coordinate the activities to overcome these.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Discussion</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Introduce the float as the difference between the latest and earliest activity time.</li> <li>Introduce the slack as the difference between the latest and the earliest event time.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Draw a part Network diagram with only one activity and event at its both ends.</li> <li>Identify the Total float, Free Float and Independent float associated with the activity.</li> <li>Identify the Head Slack and Tail Slack associated with the activity.</li> <li>Now take a Project Network and work out Floats and Slacks associated with all activities.</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign one case as home assignment.</li> <li>Suggested Reading Operations Research By PP Pai. Quantitative Methods in Management by ND Vohra, <a href="https://www.gangainstitute.com/wp-content/uploads/2019/09/Network-Analysis-PERT-N-CPM-FINAL1.pdf">https://www.gangainstitute.com/wp-content/uploads/2019/09/Network-Analysis-PERT-N-CPM-FINAL1.pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learning</p>

<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li><li>2. Quiz Spend 5 minutes to evaluate student assimilation of the lesson contents</li></ol>
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<b>Lesson Plan No. 30</b>	<b>Course Name: Operations Research</b> <b>Topic: Network Technique CPM &amp; PERT</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Networks in Linear Programming.</li> <li>Understand the importance of Networks towards planning &amp; scheduling of large projects.</li> <li>Learn the technique to minimise the criticalities like delays, interruptions and coordinate the activities to overcome these.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Discussion</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Revise all the three types of Floats.</li> <li>Revise the Slacks concept.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Take up a Project Network and work out Floats associated with all activities and record on a table.</li> <li>Take up a Project Network and work out slacks associated with all activities and record it on a table.</li> <li>Now based on Floats work out critical activities and Critical path.</li> <li>Solve one sample case in the class.</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign one case as home assignment.</li> <li>Suggested Reading Operations Research By PP Pai. Quantitative Methods in Management by ND Vohra, <a href="https://madeeasy.in/uploads/examsolution/PERTCPM.pdf">https://madeeasy.in/uploads/examsolution/PERTCPM.pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learning</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> <li>Quiz</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



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<b>Lesson Plan No. 31</b>	<b>Course Name: Operations Research</b> <b>Topic: Network Technique CPM &amp; PERT</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Networks in Linear Programming.</li> <li>Understand the importance of Networks towards planning &amp; scheduling of large projects.</li> <li>Learn the technique to minimise the criticalities like delays, interruptions and coordinate the activities to overcome these.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Discussion</li> <li>Problem Solving</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Introduce the necessity to crash a given Network and the cost effects thereafter.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Draw a diagram indicating direct cost, indirect cost and total cost curves on time domain.</li> <li>Explain the effect of direct and indirect cost of resources as the project time is crashed.</li> <li>Identify the crash time and the resources required thereof.</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Suggested Reading Operations Research By PP Pai. Quantitative Methods in Management by ND Vohra, <a href="https://madeeasy.in/uploads/examsolution/PERTCPM.pdf">https://madeeasy.in/uploads/examsolution/PERTCPM.pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learning</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> <li>Quiz Spend 5 minutes to evaluate student assimilation of the lesson contents</li> </ol>

<b>Lesson Plan No. 32</b>	<b>Course Name: Operations Research</b> <b>Topic: Network Technique CPM &amp; PERT</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Networks in Linear Programming.</li> <li>Understand the importance of Networks towards planning &amp; scheduling of large projects.</li> <li>Learn the technique to minimise the criticalities like delays, interruptions and coordinate the activities to overcome these.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Problem Solving</li> <li>Discussion</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction (05 minutes)</b> <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Revise the Crash diagram and the time /resource effects.</li> </ul> </li> <li><b>Development (25 minutes)</b> <ol style="list-style-type: none"> <li>Draw a project network indicating normal and crash time of each activity. Also indicate normal and crash cost of each activity.</li> <li>Compute the project completion time using the normal time data.</li> <li>Work out the cost slope for each activity using the normal and crash data.</li> <li>Draw a square network indicating the cost slope and floats for all activities, as applicable.</li> <li>Crash the activities one by one on the critical path, starting with the activity having lowest cost slope.</li> <li>As the floats are being consumed, carry out compensatory crashing on the non-critical activities associated.</li> <li>Crash the activities up to the duration specified in the question.</li> <li>Work out the extra cost incurred as the project duration is crashed.</li> <li>Using above procedure solve a sample case.</li> </ol> </li> <li><b>Exercise (5 minutes) –</b> Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign one numerical as home assignment.</li> <li><b>Suggested Reading</b> Operations Research By PP Pai. Quantitative Methods in Management by ND Vohra, Spend 5 minutes to wrap up and consolidate the learning</li> </ol>

<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li><li>2. Quiz Spend 5 minutes to evaluate student assimilation of the lesson contents</li></ol>
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<b>Lesson Plan No. 33</b>	<b>Course Name: Operations Research</b> <b>Topic: Game Theory</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. Articulate the concept of Game theory in Linear Programming.</li> <li>b. Understand the importance of Game theory in Business competitive situations by arriving competitive solution.</li> <li>c. Learn the technique to arrive at Competitive solutions in various complicated competitive situations.</li> </ul>
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. White Board</li> <li>b. Problem Solving</li> <li>c. Discussion</li> </ul>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (05 minutes) <ul style="list-style-type: none"> <li>- Ask questions from previous lecture.</li> <li>- Introduce the Game theory concept.</li> <li>- Discuss Rules of the game.</li> <li>- Introduce &amp; Discuss different terminologies used &amp; types of games.</li> </ul> </li> <li>2. <b>Development</b> (25 minutes) <ul style="list-style-type: none"> <li>a. Discuss two person zero Sum game.- <ul style="list-style-type: none"> <li>- A two-player game is called a zero-sum game if the sum of the payoffs to each player is constant for all possible outcomes of the game. More specifically, the terms (or coordinates) in each payoff vector must add up to the same value for each payoff vector.</li> </ul> </li> <li>b. Discuss minimax &amp; maximin strategies used.</li> <li>c. Discuss Saddle point situation. <ul style="list-style-type: none"> <li>- Saddle points of a multivariable function are those points in its domain where the tangent is parallel to the horizontal axis, but this point tends to be neither a local maximum nor a local minimum.</li> </ul> </li> <li>d. Solve a sample case by using above terminologies and strategies..</li> </ul> </li> <li>3. <b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>2. Assign sample Cases as home assignment.</li> <li>3. Suggested Reading Operations Research By S Kalavathy. <a href="https://kanchiuniv.ac.in/coursematerials/Game%20theory.pdf">https://kanchiuniv.ac.in/coursematerials/Game%20theory.pdf</a> <a href="https://www.acsce.edu.in/acsce/wp-content/uploads/2020/03/Operation-Research-17CS653-Module-5.pdf">https://www.acsce.edu.in/acsce/wp-content/uploads/2020/03/Operation-Research-17CS653-Module-5.pdf</a></li> </ol>

	Spend 5 minutes to wrap up and consolidate the learnings
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> <li>2. Quiz</li> </ol> Spend 5 minutes to evaluate student assimilation of the lesson contents

<b>Lesson Plan No. 34</b>	<b>Course Name: Operations Research</b> <b>Topic: Game Theory continued.</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Game theory in Linear Programming.</li> <li>Understand the importance of Game theory in Business competitive situations by arriving competitive solution.</li> <li>Learn the technique to arrive at Competitive solutions in various complicated competitive situations.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Problem Solving</li> <li>Discussion</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Revise the Game theory concept.</li> <li>Revise the Rules of the game through interaction.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Revise Two Person Zero Sum game.</li> <li>Revise minimax &amp; maximin strategies used.</li> <li>Discuss &amp; examine Saddle point situation involving Value of the Game.</li> <li>Solve few sample cases by using above strategies to examine saddle point, Fare game, strictly determinable game situation and situation when Saddle point does not exist.</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign sample Cases as home assignment.</li> <li>Suggested Reading Quantitative Techniques in Management by ND Vohra. Operations Research By S Kalavathy. <a href="https://faculty.nps.edu/awashburn/Files/Notes/GameTheory.pdf">https://faculty.nps.edu/awashburn/Files/Notes/GameTheory.pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> <li>Quiz</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

<b>Lesson Plan No. 35</b>	<b>Course Name: Operations Research</b> <b>Topic: Game Theory continued.</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Game theory in Linear Programming.</li> <li>Understand the importance of Game theory in Business competitive situations by arriving competitive solution.</li> <li>Learn the technique to arrive at Competitive solutions in various complicated competitive situations.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Problem Solving</li> <li>Discussion</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Revise the Game theory concept.</li> <li>Introduce situations without Saddle Point.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Revise Two Person Zero Sum game.</li> <li>Revise minimax &amp; maximin strategies used.</li> <li>Discuss &amp; examine situation when Saddle Point does not exist.</li> <li>Examine the situation when Game is neither fair nor is Strictly determinable</li> <li>Introduce the mixed strategies concept to arrive at the competitive strategies and Value of the Game.</li> <li>Solve few sample questions..</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Assign sample Cases as home assignment.</li> <li>Suggested Reading Quantitative Techniques in Management by ND Vohra. Operations Research By S Kalavathy. <a href="https://people.ohio.edu/melkonian/math4620/chapter14.pdf">https://people.ohio.edu/melkonian/math4620/chapter14.pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> <li>Quiz</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>

<b>Lesson Plan No. 36</b>	<b>Course Name: Operations Research</b> <b>Topic: Game Theory continued.....</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. Articulate the concept of Game theory in Linear Programming.</li> <li>b. Understand the importance of Game theory in Business competitive situations by arriving competitive solution.</li> <li>c. Learn the technique to arrive at Competitive solutions in various complicated competitive situations.</li> </ul>
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. White Board</li> <li>b. Problem Solving</li> <li>c. Discussion</li> </ul>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (05 minutes) <ul style="list-style-type: none"> <li>- Ask questions from previous lecture.</li> <li>- Introduce the Domination Concept.</li> <li>- Introduce the convex Linear Combination Situation..</li> </ul> </li> <li>2. <b>Development</b> (25 minutes) <ul style="list-style-type: none"> <li>a. Revise minimax &amp; maximin strategies used.</li> <li>b. Discuss &amp; examine the bigger size value matrix (m x n) and situation when Saddle Point does not exist and the game is not strictly determinable.</li> <li>c. Apply Domination Rule to delete the strategies which are inferior and are being dominated, thus to reach 2 x 2 game situation, where mixed strategy can be applied.</li> <li>d. The situations where the value matrix cannot be reduced to 2 x 2 size even by Domination, Convex linear combination methodology is used.</li> <li>e. Apply the mixed strategies concept to arrive at the competitive strategies and Value of the Game.</li> <li>f. Solve few sample questions..</li> </ul> </li> <li>3. <b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>2. Assign sample Cases as home assignment.</li> <li>3. Suggested Reading Quantitative Techniques in Management by ND Vohra. <a href="https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/mathematics/14_operations_research/09_game_theory_basic_concept_and_terminologies_two-person_zero-sum_game_and_game_with_pure_and_mixed_strategies/et/9226_et_et.pdf">https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/mathematics/14_operations_research/09_game_theory_basic_concept_and_terminologies_two-person_zero-sum_game_and_game_with_pure_and_mixed_strategies/et/9226_et_et.pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>

<b>Evaluation</b>	<ol style="list-style-type: none"><li>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li><li>2. Quiz Spend 5 minutes to evaluate student assimilation of the lesson contents</li></ol>
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<b>Lesson Plan No. 37</b>	<b>Course Name: Operations Research</b> <b>Topic: Game Theory continued....</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. Articulate the concept of Game theory in Linear Programming.</li> <li>b. Understand the importance of Game theory in Business competitive situations by arriving competitive solution.</li> <li>c. Learn the technique to arrive at Competitive solutions in various complicated competitive situations.</li> </ul>
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. White Board</li> <li>b. Problem Solving</li> <li>c. Discussion</li> </ul>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (05 minutes) <ul style="list-style-type: none"> <li>- Ask questions from previous lecture.</li> <li>- Revise the Domination Concept.</li> </ul> <p>Introduce the situation when the Value Matrix Size cannot be reduced beyond <math>2 \times n</math>.</p> </li> <li>2. <b>Development</b> (25 minutes) <ul style="list-style-type: none"> <li>a. Discuss &amp; examine the bigger size value matrix (<math>m \times n</math>) and situation when Saddle Point does not exist and the game is not strictly determinable.</li> <li>b. Apply Domination Rule to delete the strategies which are inferior and are being dominated.</li> <li>c. When the Value matrix is not reduced beyond <math>2 \times n</math> size, Graphical technique is used to reduce it to <math>2 \times 2</math> size.</li> <li>d. Apply the mixed strategies concept to arrive at the competitive strategies and Value of the Game.</li> <li>e. Solve two sample questions.</li> </ul> </li> <li>3. <b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>2. Assign sample Cases as home assignment.</li> <li>3. Suggested Reading Quantitative Techniques in Management by ND Vohra. Operations Research by S Kalavathy. <a href="https://www.cs.cmu.edu/afs/cs/academic/class/15859-f01/www/notes/mat.pdf">https://www.cs.cmu.edu/afs/cs/academic/class/15859-f01/www/notes/mat.pdf</a></li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>



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<b>Lesson Plan No. 38</b>	<b>Course Name: Operations Research</b> <b>Topic: Game Theory &amp; Simulation</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. Articulate the concept of Game theory in Linear Programming.</li> <li>b. Understand the importance of Game theory in Business competitive situations by arriving competitive solution.</li> <li>c. Learn the technique to arrive at Competitive solutions in various complicated competitive situations.</li> </ul>
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. White Board</li> <li>b. Problem Solving</li> <li>c. Discussion</li> </ul>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (05 minutes) <ul style="list-style-type: none"> <li>- Ask questions from previous lecture.</li> <li>- Revise the Domination Concept.</li> </ul> Introduce the situation when the Value Matrix Size cannot be reduced beyond <math>m \times 2</math>. </li> <li>2. <b>Development</b> (25 minutes) <ul style="list-style-type: none"> <li>a. Discuss &amp; examine the bigger size value matrix (<math>m \times n</math>) and situation when Saddle Point does not exist and the game is not strictly determinable.</li> <li>b. Apply Domination Rule to delete the strategies which are inferior and are being dominated.</li> <li>c. When the Value matrix is not reduced beyond <math>m \times 2</math> size, Graphical technique is used to reduce it to <math>2 \times 2</math> size.</li> <li>d. Apply the mixed strategies concept to arrive at the competitive strategies and Value of the Game.</li> <li>e. Solve two sample questions.</li> </ul> </li> <li>3. <b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>2. Assign sample Cases as home assignment.</li> <li>3. Suggested Reading Operations Research by S Kalavathy. Quantitative Techniques in Management by ND Vohra. Spend 5 minutes to wrap up and consolidate the learnings</li> </ol>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> <li>2. Quiz Spend 5 minutes to evaluate student assimilation of the lesson contents</li> </ol>



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<b>Lesson Plan No. 39</b>	<b>Course Name: Operations Research</b> <b>Topic: Simulation</b>	<b>Course No.: MBA-203</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ol style="list-style-type: none"> <li>Articulate the concept of Simulation in Linear Programming.</li> <li>Understand the importance of Simulation in Business competitive situations by arriving competitive solution.</li> <li>Learn the technique to arrive at the solutions through Simulation.</li> </ol>
<b>Teaching Aids (if any)</b>	<ol style="list-style-type: none"> <li>White Board</li> <li>Problem Solving</li> <li>Discussion</li> </ol>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li><b>Introduction</b> (05 minutes)           <ul style="list-style-type: none"> <li>Ask questions from previous lecture.</li> <li>Introduce the Simulation concept.</li> <li>Introduce Random Variable.</li> <li>Introduce Monte Carlo Simulation.</li> </ul> </li> <li><b>Development</b> (25 minutes)           <ol style="list-style-type: none"> <li>Discuss Types of Simulation.</li> <li>Discuss Process of Simulation.</li> <li>Discuss Random Number &amp; Pseudo Random Number.</li> <li>Discuss Monte Carlo Simulation Technique.</li> </ol> </li> <li><b>Exercise</b> (5 minutes) – Conduct Quiz by asking questions and discuss.</li> </ol>
<b>Closure</b>	<ol style="list-style-type: none"> <li>Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>Suggested Reading Quantitative Techniques in Management by ND Vohra. <a href="https://egyankosh.ac.in/bitstream/123456789/10664/1/Unit-15.pdf">https://egyankosh.ac.in/bitstream/123456789/10664/1/Unit-15.pdf</a> Spend 5 minutes to wrap up and consolidate the learning</li> </ol>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>Reflective Questions (What, Why, How?). Allow students to answer and discuss.</li> <li>Quiz Spend 5 minutes to evaluate student assimilation of the lesson contents</li> </ol>

<b>Lesson Plan No. 1</b>	<b>Course Name: Operations Management</b> <b>Topic: Introduction to Operations Management</b>	<b>Course No.: MBA-206</b>
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<b>Objectives</b>	At the end of the lesson the student shall be able to: <ul style="list-style-type: none"> <li>a. Understand the concept of Operations Management</li> <li>b. Interpret the nature of Operations Management</li> <li>c. Explain the scope of Operations Management</li> </ul>
<b>Teaching Aids (if any)</b>	<ul style="list-style-type: none"> <li>a. Power Point Presentation</li> <li>b. Video- <a href="https://www.youtube.com/watch?v=Y28MsljBgvU">https://www.youtube.com/watch?v=Y28MsljBgvU</a></li> <li>c. Live examples</li> <li>d. ET news discussion</li> </ul>
<b>Teaching Development</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction</b> (05 minutes) <ul style="list-style-type: none"> <li>- Ask questions What do you mean by Operations What do understand by the term Management</li> <li>- Introduce the concept of Operations Management</li> <li>- Introduce the formal definition of Operations Management</li> </ul> </li> <li>2. <b>Development</b> (25 minutes) <ol style="list-style-type: none"> <li>a) Introduction <ul style="list-style-type: none"> <li>- Explain the concept of Operations Management <ul style="list-style-type: none"> <li>- Operations management is the administration of business structure, practices, and processes to enhance efficiency and maximize profit. It refers to the management of functions that a business needs to run effectively day-to-day, including: Overseeing multiple departments and providing goals</li> </ul> </li> <li>- Define Operations Management</li> </ul> </li> <li>b) Nature and Scope <ul style="list-style-type: none"> <li>- Highlight the nature of Operations Management</li> <li>- Discuss the scope of Operations Management <ul style="list-style-type: none"> <li>- It is the process of planning, organising, directing, and controlling the resources needed to produce goods and services. The scope of operations management includes all the activities necessary to plan, design, and manage the production and distribution process.</li> </ul> </li> <li>- Video to be displayed</li> </ul> </li> </ol> </li> <li>3. Exercise (5 minutes) – <ul style="list-style-type: none"> <li>- Quiz will be conducted</li> <li>- Video to be displayed</li> </ul> </li> </ol>

<b>Closure</b>	<ol style="list-style-type: none"> <li>1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.</li> <li>2. Discuss the University Questions from the Syllabus.</li> <li>3. Suggested Reading Production and Operational Management by K Ashwathappa, Sreedhar Bhat</li> </ol> <p>Spend 5 minutes to wrap up and consolidate the learnings</p>
<b>Evaluation</b>	<ol style="list-style-type: none"> <li>1. Reflective Questions (What, Why, Who?). Allow students to answer.</li> <li>2. Conduct Quiz</li> </ol> <p>Spend 5 minutes to evaluate student assimilation of the lesson contents</p>