

## *ERP (21-550)*

*Advanced Manufacturing Laboratory  
Department of Industrial Engineering  
Sharif University of Technology*

*Session #15*

## *Course Description*

### ▪ *Instructor*

- *Omid Fatahi Valilai, Ph.D. Industrial Engineering Department, Sharif University of Technology*
- *Email: [FValilai@sharif.edu](mailto:FValilai@sharif.edu), Tel: 6616-5706*
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### ▪ *Class time*

- *Sunday-Tuesday*                      *16:30-18:30*
- *Wednesday*                              *09:00-12:00*

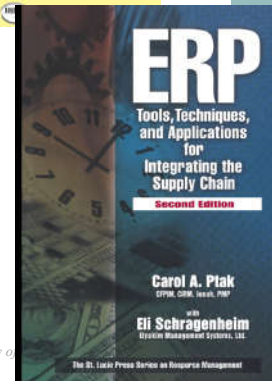
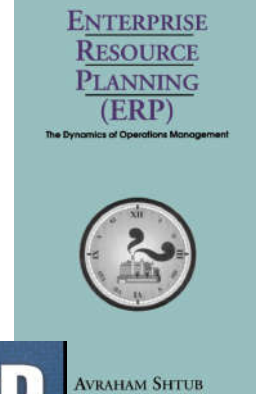
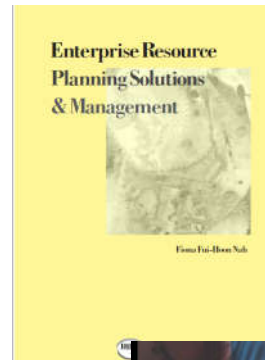
### ▪ *Course evaluation*

- *Mid-term*                                      *(30%)*
- *Final exam*                                      *(40%)*
- *Quiz*                                              *(5%)*
- *Exercise*                                        *(10%)*
- *ERP Lab*                                        *(15%)*

## Course Description (Continued ...)

- **Mid-term session:**
  - Sunday : 8<sup>th</sup> Azar 1394, 16:30 ~ 18:00
- **Final Exam:**
  - Sunday: 27<sup>th</sup> Dey 1394, 09:00 ~ 10:30
- **Reference:**
  - Shtub, A., "Enterprise Resource Planning (ERP)- The dynamics of operations management", 2002, Kluwer Academic Publishers
  - Ptak, Carol A., "ERP Tools, Techniques, and Applications for Integrating the Supply Chain", 2004, The CRC Press
  - Fui, F., Nah, H., "Enterprise Resource Planning", 2002, IRM Press

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- **Reference:**
  - Daniel E. O'leary, "Enterprise Resource Planning Systems Systems, Life Cycle, Electronic Commerce, and Risk", 2000, Cambridge University Press

### Enterprise Resource Planning Systems

Systems, Life Cycle, Electronic Commerce, and Risk



Daniel E. O'Leary

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## *Course Description (Continued..)*

- *Contents:*
  - *Enterprise Management*
    - *History of Enterprise Resource Planning*
    - *The Theory of Constraints and ERP*
    - *Sales and Operations Planning*
    - *Buffer Resource Strategy*
    - *Enterprise Resource Management*
    - *Integrating the Supply Chain to Reap the Rewards*
    - *Strategic Sourcing and Procurement*

## *Course Description (Continued..)*

- *Contents:*
  - *Operations Management*
    - *Operations Planning (Material and Capacity Requirements Planning)*
    - *Product Life Cycle Management*
    - *Manufacturing Execution System*
    - *Distribution*

## *Operations Management*

- *Material and capacity requirements Planning:*
  - *Balance Supply and Demand*
  - *Demand management attempts to balance supply and demand.*
  
- *Demand can come from forecasts, customer orders, distribution, spare parts, safety stock, interdivisional requirements, and new products.*
  
- *Supply can come from material in inventory or expected on factory orders, capacity (labor or machine), and directly from suppliers.*

## *Operations Management*

- *Material and capacity requirements Planning:*
  - *Balance Supply and Demand*
  - *When demand exceeds supply there must be an effective demand prioritization process in effect until the supply can be increased.*
  
- *In reality the order entry and promising process must address the following three questions:*
  - *What is the best business practice for the company?*
  - *Who needs to be involved?*
  - *What mechanics are required?*
  
- *Proper forecast consumption mechanics can be crucial to having demand stability. The first attempt at forecast consumption logic is a simple*

## Operations Management

- *Material and capacity requirements Planning:*
  - *Balance Supply and Demand*



### European Journal of Operational Research

Volume 247, Issue 2, 1 December 2015, Pages 472–487



Production, Manufacturing and Logistics

## Prioritizing regular demand while reserving capacity for emergency demand

Xinxin Hu<sup>a</sup>, Ying Li<sup>b</sup>, Eunshin Byon<sup>c</sup>, F Barry Lawrence<sup>a</sup>

## Operations Management

- *Material and capacity requirements Planning:*
  - *Balance Supply and Demand*
  - *Abnormal demand types include:*
    - *One time demands—This order will never be seen again and should not be included in future forecasts.*
    - *Ordering pattern change for timing—This could be due to a budget cycle being reset or pricing strategy change. This would impact future forecasts if the new budget cycle or pricing strategy were expected to remain.*

## Operations Management

- *Material and capacity requirements Planning:*
  - *Balance Supply and Demand*
  - *Abnormal demand types include:*
    - *Time to change the forecast—Abnormal demand may point out where the forecasting process or underlying assumptions are in error.*
    - *Wrong seasonal timing pattern—This may sometimes be caused by an alternate use being developed for a product such as a waterski board now being used as a snowboard.*
    - *Spiked demand—This could be absolutely normal if the demand is dependent on inventory in the supply chain. In this case forecasting is not the right answer. Better results would be obtained using Distribution Requirements Planning.*

## Operations Management

- *Material and capacity requirements Planning:*
  - *Balance Supply and Demand*
  - *The standard default scheduling process is backward scheduling.*
  - *The master schedule date is taken as the end point and then all components are offset backwards through time by their respective lead-times to determine the required completion and start dates for each.*
  - *Backward scheduling is best used when the demand is known in advance of the expected lead-time.*
  - *This scheduling method provides the least amount of inventory by starting orders at the last possible moment.*



## Operations Management

- *Material and capacity requirements Planning:*
  - *MRP system requirements*
    - *Master Production Schedule*
      - *An MPS is required to drive the MRP system.*
      - *This master schedule contains items that are fully defined in BOM terms.*
      - *The master schedule is a statement of what is planned to be completed by defining quantities and timing for each parent item.*
      - *The BOM defines the components for each parent.*
      - *The master schedule answers the question of how much and when for the finished item.*
      - *MRP uses these two inputs to calculate how much and when given the current inventory position*

## Operations Management

- *Material and capacity requirements Planning:*
  - *MRP system requirements*
    - *Every inventory item that will be stocked must be identified uniquely and have an inventory record available.*
    - *Inventory records include information about:*
      - *On hand*
      - *On order*
      - *Lead-time*
      - *Planning data*
    - *Unique Item Identification*
      - *MRP plans by unique items. Having multiple identification numbers for a part because there are multiple suppliers will not allow MRP to add the requirements for this part together and suggest the best order quantity possible.*



## Operations Management

- *Material and capacity requirements Planning:*
  - *Capacity Requirement Planning*
    - *The function of establishing, measuring, and adjusting limits or levels of capacity.*
    - *The term 'capacity requirements planning' (CRP) in this context refers to the process of determining in detail the amount of labor and machine resources required to accomplish the tasks of production.*
    - *Open shop orders and planned orders in the MRP system are input to CRP.*
    - *Even though rough-cut capacity planning may indicate that sufficient capacity exists to execute the master production schedule, CRP may show that capacity is insufficient during specific time periods.*

## Operations Management

- *Material and capacity requirements Planning:*
  - *Capacity Requirement Planning*
    - *CRP follows exactly the same logic as materials requirements planning and plans the amount of critical resources needed to carry out the MPS.*
    - *These resources can be labor hours, machine hours, cash, or any other constraint to the process.*
    - *APS systems attempt to provide an optimized schedule based on the constraints in the process, the required customer demand, and the impact of production sequencing.*

## *Operations Management*

- *Material and capacity requirements Planning:*
  - *Capacity Requirement Planning*
    - *CRP answers the question of how much resource is required and when is it required.*
    - *The early adopters of APS systems quickly discovered that the level of data accuracy required to develop a feasible solution required more resources than expected.*
    - *The sophisticated models can cost more to build than the value of the answer for discrete manufacturing businesses.*
    - *APS systems have found the most success in process industries where there is higher reliability of inputs due to the high levels of automation.*