University of Anbar   **Course Title: construction management**
College of Engineering   **Year:(3) Civil Eng. Department**
2018- 2019

المحاضرة (٨)

Resource Allocation & Leveling Management Techniques

- Means to complete project activities are called RESOURCES.

- Examples are People, Machinery, Material, Capital, Time, etc.

- Peak demands of resources over short periods is undesirable.

- Resources may be limited or unlimited in nature from project to project.

Resource Utilization Factor

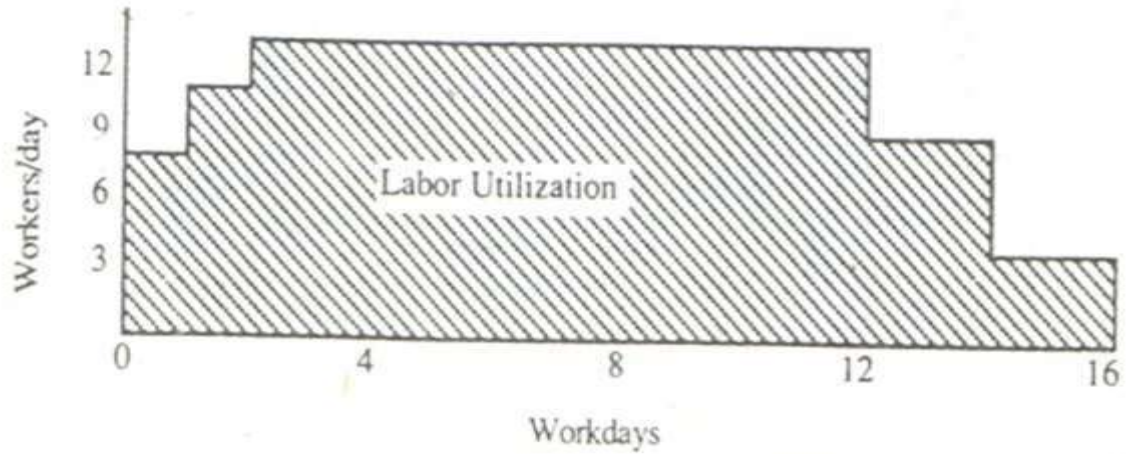- The degree to which a resource may be used is measured in terms of a Resource Utilization Factor.

Mathematically,

Usable Resources x Days Used x 100 R.U.F. (%) = Usable Resources x Days available.

Resource Profile

- Plot of daily Resource requirements versus time is called
    - Resource Profile
    - Resource-use Graph
    - Histogram

University of Anbar   **Course Title: construction management**
College of Engineering   **Year:(3) Civil Eng. Department**
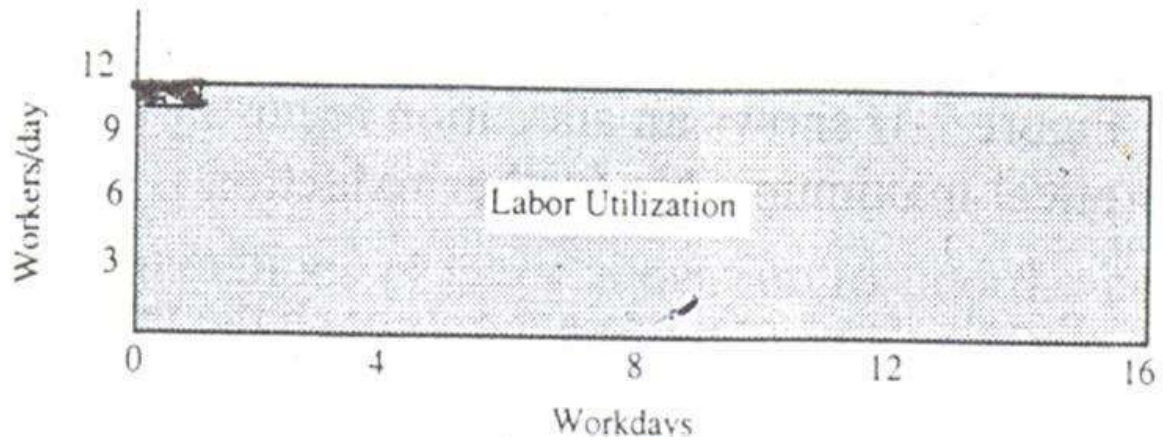**2018- 2019**

المحاضرة (٨)

Resource Allocation

To assign required resources to work activities such that available resources are not exceeded.

Resource Leveling

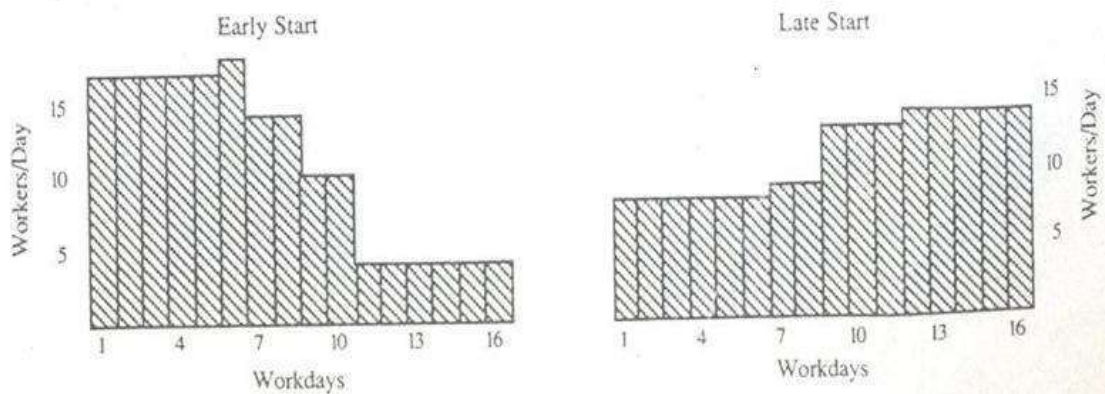- Smoothening of a resource demand is called Resource leveling.
- Resource leveling is an attempt to assign resources to project activities in a manner that will improve productivity and efficiency.

University of Anbar
College of Engineering
2018- 2019

Course Title: construction management
Year:(3) Civil Eng. Department

المحاضرة (٨)

Ideal Condition

Early-start and Late-start Histograms

University of Anbar
College of Engineering
2018- 2019

Course Title: construction management
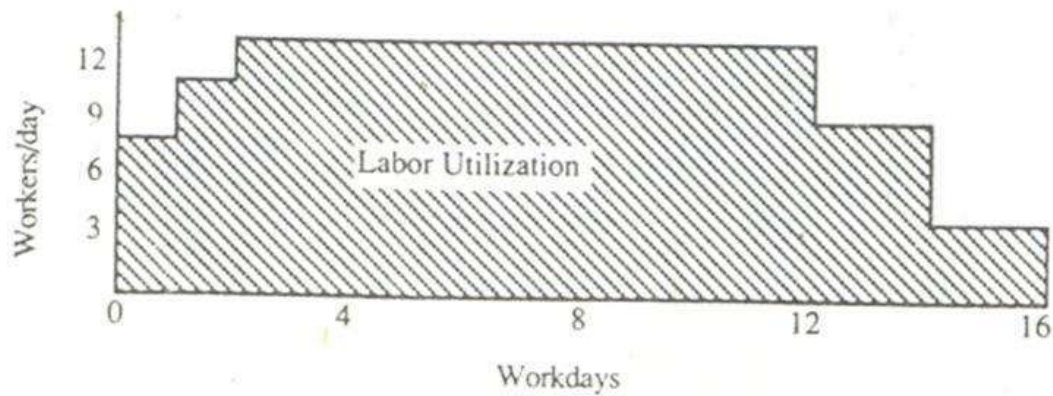**Year:(3) Civil Eng. Department**

المحاضرة (٨)

Ideal Level Histogram
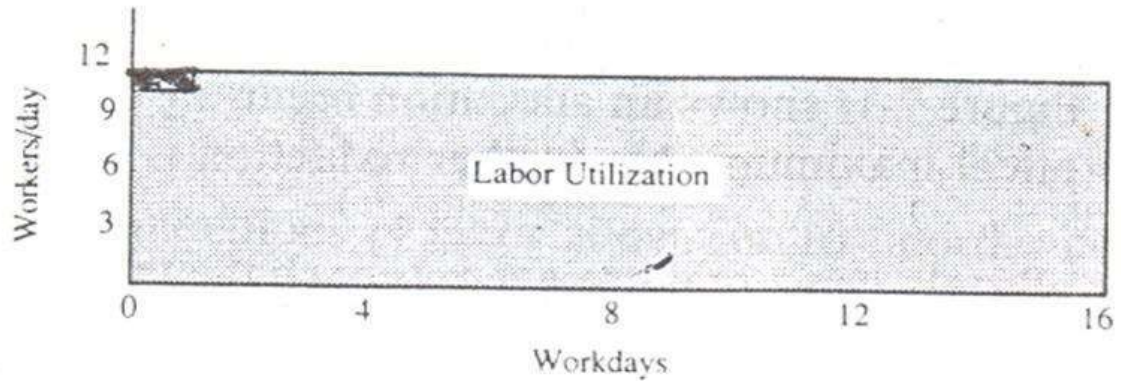
Practical & Target Histogram

Objects of Resource Leveling

- Fixed Crew Size
- Learning Curve
- Start-up Problems
- Completion Congestion

Techniques for Resource Leveling

University of Anbar		**Course Title: construction management**
College of Engineering		**Year:(3) Civil Eng. Department**
2018- 2019		

المحاضرة (٨)

- Sum of Resources Square method
- Burgess Leveling Procedure
- Wiest Leveling Procedure

Limited Resource Allocation

- Where resources e.g., plant, labour, materials (or capitals) are restricted, the activities have to be rescheduled to satisfy this form of constraint. This will imply scheduling those activities that use such resources, in a sequential or serial fashion. And this might create the situation where activities overrun their allowable float.
- If resource limitations are known at the outset, for example, only one site crane is available, then the original network plan for the project can include this constraint.
- In certain cases, it may be possible to hire additional plant to cover peak requirements; in this case no rescheduling of the activities is called for

Algorithm

1. Calculate initial early start (ES) and late start (LS) time for each activity in the project, and set time now equal to1, i.e., T = 1
2. Determine the initial eligible activity set (EAS), i.e., those activities with all predecessor activities scheduled.
3. From among the members of the current EAS, determine the ordered scheduling set (OSS) of activities i.e., activities with ES < T, ordered

University of Anbar
College of Engineering
2018- 2019

Course Title: construction management
Year:(3) Civil Eng. Department

المحاضرة (٨)

according to LS with smallest values first and within this characteristic, according to least activity duration first.

4. Consider the activities in OSS in the order listed and schedule those activities for which sufficient resources are available for the duration of the activity. As activities are scheduled, update the level of resources available, and update the members of EAS.

5. Have all activities been scheduled, i.e., is EAS empty set ?

If Yes STOP

If No Set T new = T old + 1, and

compute new ES times for the updated EAS.

1. Go to step 3 and continue.

EXAMPLE

Reschedule the Project given in Figure keeping in view the limitation of Resources L to be 8 per day and M to be 6 per day.

University of Anbar **Course Title: construction management**
College of Engineering **Year:(3) Civil Eng. Department**
2018- 2019

المحاضرة (٨)

ACT

EST	EFT
LST	LFT
TF	FF

A
1	3
6	8
5	0

B
1	3
1	3
0	0

C
1	2
7	8
6	0

D
3	7
8	12
5	0

E
3	8
4	9
1	0

F
3	11
3	11
0	0

G
2	5
8	11
6	6

H
7	8
12	13
5	4

I
8	12
9	13
1	0

J
11	16
11	16
0	0

K
12	15
13	16
1	0
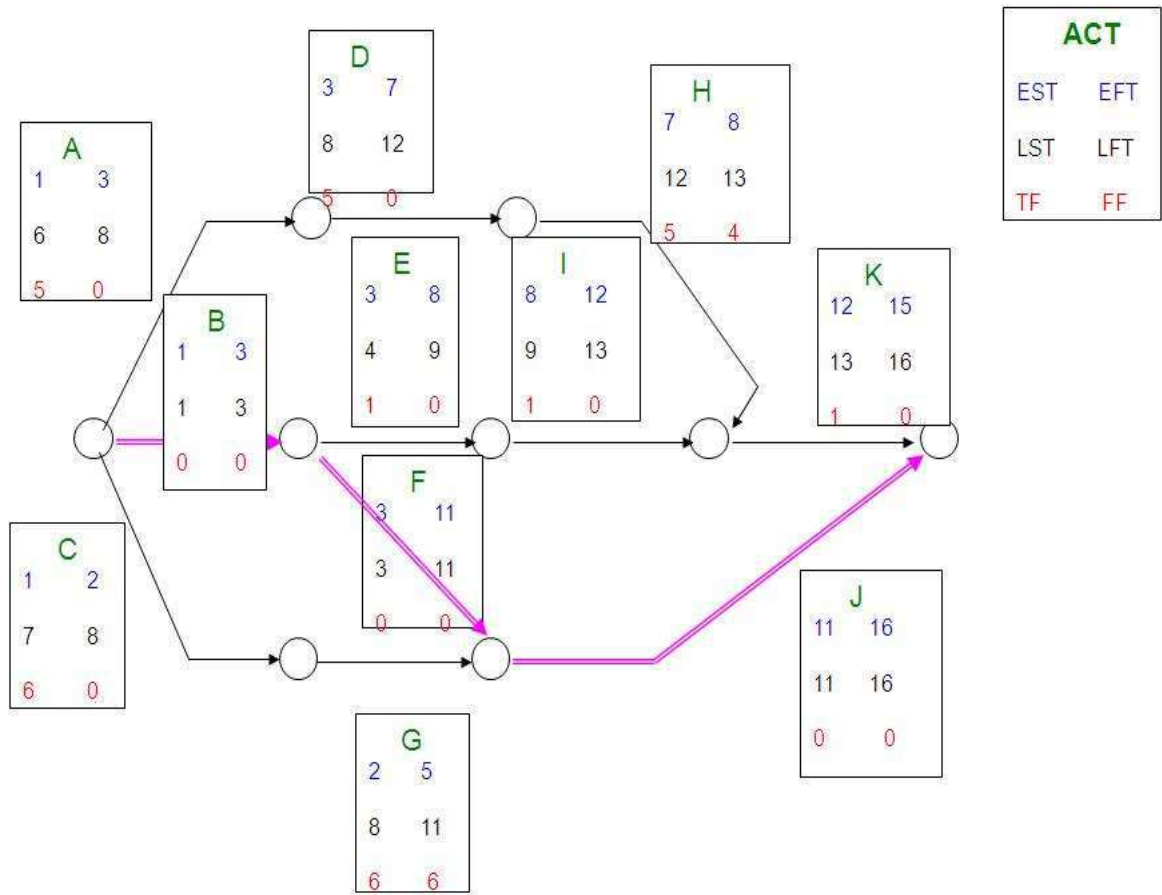
المحاضرة (٨)

Act	Resources Required		D	ES	F	L	Time																	
	L	M					1 S	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A	3	—	2	1	5	6			3L X	3L X														
D	—	2	4	3	5	8								x 2M	x 2M	x 2M	x 2M							
B*	6	—	2	1	0	1	6L X	6L X																
E	—	2	5	3	1	4			x 2M	x 2M	x 2M	x 2M	x 2M											
H	4	—	1	7	5	12															4L X			
I	2	—	4	8	1	9								2L X	2L X	2L X	2L X							
C	3	—	1	1	6	7					3L X													
F*	4	4	8	3	0	3			4L 4M	4L 4M	4L 4M	4L 4M	4L 4M	4L 4M	4L 4M	4L 4M								
G	5	—	3	2	6	8											5L X	5L X	5L X					
K	—	5	3	12	1	13															x 5M	x 5M	x 5M	
J*	2	—	5	11	0	11															2L X	2L X	2L X	2L X	2L X

Let T = 1

EAS : A B C (E F)

ES : 1 1 1

LS : 6 1 7

OSS : B A C

Schedule B to days 1-2

Remove B from EAS

Add F to EAS

University of Anbar   **Course Title: construction management**
College of Engineering   **Year:(3) Civil Eng. Department**
2018- 2019

المحاضرة (٨)

Let T = 2

EAS : A C E F

ES : 2 2 3 3

LS : 6 7 4 3

OSS : A C

No Activity can be scheduled on T = 2

Let T = 3

EAS : A C E F (I D)

ES : 3 3 3 3

LS : 6 7 4 3

OSS : F E A C

Schedule F to days 3-10

Remove F from EAS

Schedule E to days 3-7

Remove E from EAS.

Schedule A to days 3-4

Remove A from EAS EAS

Add I & D to EAS

Let T = 4

EAS : C I D

ES : 4 8 5

University of Anbar **Course Title: construction management**
College of Engineering **Year:(3) Civil Eng. Department**
2018- 2019

المحاضرة (٨)

LS : 7 9 8

OSS : C

No Activity can be scheduled on T = 4

Let T = 5

EAS : C I D (G)

ES : 5 8 5

LS : 7 9 8

OSS : C D

Schedule C to day 5

Remove C from EAS

Add G to EAS

Let T = 6

EAS : I D G

ES : 8 6 6

LS : 9 8 8

OSS : G D

No Activity can be scheduled on T = 6

Note: G and D have same LS. These are ordered on less duration first.

المحاضرة (٨)

LEVEL OF RESOURCE L UNASSIGNED																	
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
2	2	4	4	4	4	4	4	4	4	6	3	3	6	6	6	6	6
	1	1	1			2	2	2	1			2					

LEVEL OF RESOURCE M UNASSIGNED																	
6	6	6	6	6	6	6	6	6	6	5	6	6	6	6	6	6	6
		2	2	2	2	2	3	3	2	4				1	1	1	
		0	0	0	0	0	0	0	0								

LEVEL OF RESOURCE L UNASSIGNED																	
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
2	2	4	4	4	4	4	4	4	4	6	3	3	6	6	6	6	6
	1	1	1			2	2	2	1			2					

LEVEL OF RESOURCE L ASSIGNED

University of Anbar   **Course Title: construction management**
College of Engineering   **Year:(3) Civil Eng. Department**
2018- 2019

المحاضرة (٨)

			6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
LEVEL OF RESOURCE M UNASSIGNED			2	2	2	2	2	2	2	2	4				1	1	1	
			0	0	0	0	0	0	0	0								

LEVEL OF RESOURCE M ASSIGNED

University of Anbar
College of Engineering
Dr. Juma'a. Awad. AL-Sumaydaei

Course Title: construction management
Year:(3) Civil Eng. Department
2018- 2019

المحاضرة (٢+٣)

طرق تخطيط وجدولة المشاريع

method of planning &scheduling of projects

INTRODUCTION:

Network scheduling is a technique used for planning, and scheduling large projects in the field of construction, maintenance, fabrication, purchasing computer system etc. The technique is a method of minimizing the trouble spots such as production, delays and interruptions, by determining critical factors and coordinating various parts of the overall job. There are two basic planning and control technique that utilize a network to complete a predetermined project or schedule. These are Programed Evaluation Review Technique (PERT) and Critical Path Method (CPM).

تعريف المشروع

المشروع هنا هو عملية أو نشاط مقيد بزمن، أي له تاريخ بداية وتاريخ نهاية، يتم القيام به مرة واحدة من أجل تقديم منتج ما أو خدمة ما بهدف تحقيق تغيير مفيد أو إيجاد قيمة مضافة.

وهناك تعارض ما بين خاصية كون المشروع أمراً مؤقتاً لمرة واحدة، وبين ما تتسم به العمليات الإدارية أو التشغيلية التي تجري بشكل دائم أو شبه دائم من أجلِ تقديم نفس المنتج أو الخدمة مراراً وتكراراً. ولا تتطلب إدارة المشاريع بالضرورة نفس المتطلبات التي تتطلبها إدارة العمليات الإدارية والتشغيلية الدائمة، سواء من ناحية المهارات الفنية المطلوبة أو فلسفة العمل، ومن ثم فقد نشأت الحاجة إلى بلورة إدارة المشاريع.

وقد عرف هيرسون (١٩٩٢) المشروع بأنه " أي سلسلة من الانشطة أو المهام التي لها أهداف محدده يجب أن تنجز ضمن مواصفات محدده ولها بداية ونهاية محددتان وله تمويل ويستعمل المصادر المختلفة من اموال ووقت ومعدات وايدي عاملة.

ولقد نسب بريمان واخرين (١٩٩٥) الي ليش وتيرنر (١٩٩٠) تعريف المشروع بأنه " وحدة استثمار صناعي جديدة والتي لها بعض المعالم المميزة أو المتفردة وذلك من خلال تناغم الوقت والتكلفة".