Course: construction Management
Class: 3
Lecture No.4
Prepared by: Assist. Prof. Dr. Faris Waleed Jawad

Mustansiriya University

Collage of Engineering /Water Recourse Dept.

Bar-chart (Gantt chart) Planning Technique

A Gantt chart

It is one of the oldest and the simplest methods in planning and programming construction projects. Its beginning dates back to 1915 when it was invented before (Henry Gantt).

Commonly used in project management, is one of the most popular and useful ways of showing activities (tasks) displayed against time. On the left of the chart is a list of the activities and along the top is a suitable time scale. Each activity is represented by a bar; the position and length of the bar reflects the start date, duration and end date of the activity.

This figure shows an example of a Bar-chart (Gantt chart):
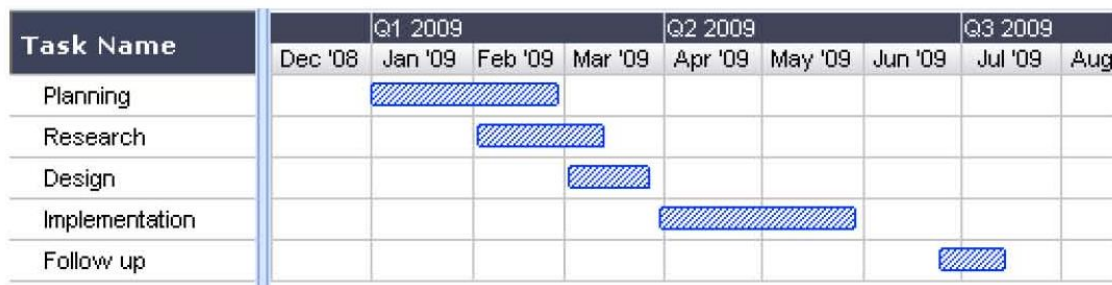
The duration of the activity may be given ready in the question as in the arrow networks or the precedence that will be taken later or calculated by knowing the amount of activity (size or area of activity) and knowing the productivity of the team.

$$\text{duration of the activity} = \frac{\textit{volume or area of activity}}{\textit{productivity of the team x No.of teams}}$$

Example: volume of foundation drilling = 126 m3 and the productivity of the team is 32 m³/day.

$$\text{duration of the activity} = \frac{126\ m3}{32\ m3/day} = 3.94 = 4\ \text{days}$$

1

Course: construction Management
Class: 3
Lecture No.4
Prepared by: Assist. Prof. Dr. Faris Waleed Jawad

Mustansiriya University

Collage of Engineering /Water Recourse Dept.

Benefits of Using Bar-chart (Gantt chart) Technique for Project Planning

1- Clarity: Gantt chart has the ability to show and clarify multiple tasks and timelines.

2- Communication: It is a visual method to help project team members understand task progress.

3- Motivation: Gantt charts offer project teams the ability to focus work at the front of, or at the tail end of a task timeline.

4- Who is working on each task and When tasks start and finish.

5- Time Management: Time scheduling is considered as one of the major benefits of Gantt charts. It can be seen the date of start and end of project

6- Flexibility: It offers a view of project which can help team members adjust changes.

7-Manageability: By using Gantt charts, project managers can make more focused, effective decisions about resources and timetables.

8-Efficiency: allows managers to make better use of people, places, and things.

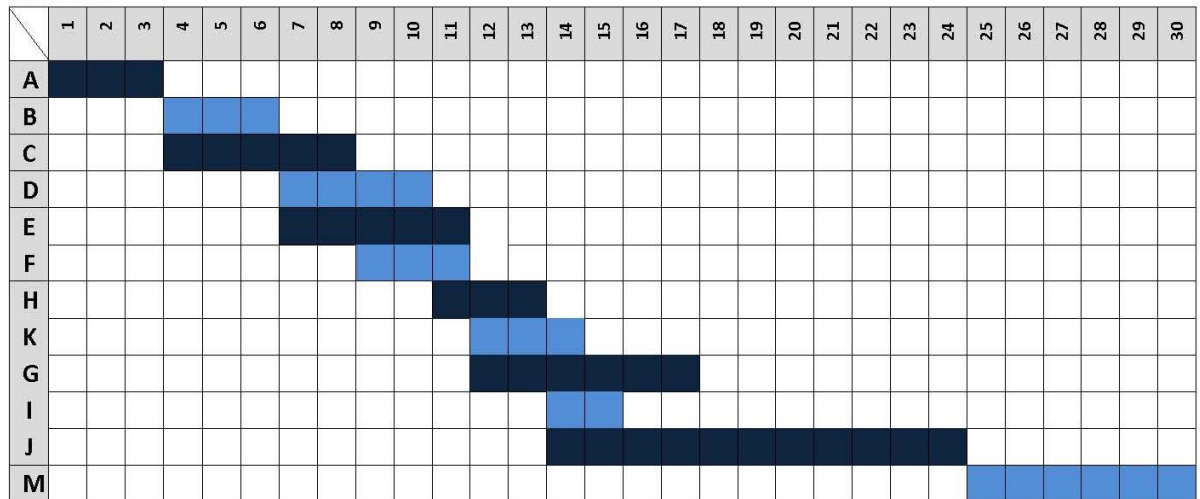## Disadvantages of Using Bar-chart (Gantt chart) Technique for Project Planning

1- The length of the bar does not indicate the amount of work.
2- They all the time need to be updated
3- Difficult to see on one sheet of paper
4- The Critical path (C.P) cannot be clearly indicated

Course: construction Management
Class: 3
Lecture No.4
Prepared by: Assist. Prof. Dr. Faris Waleed Jawad

Mustansiriya University

Collage of Engineering /Water Recourse Dept.

Examples of Project Gantt charts

Ex.1/ using the details shown below, build a Bar-chart to find the project's total duration.

Activity	A	B	C	D	E	F	H	K	G	I	J	M
Duration (days)	3	3	5	4	5	3	3	3	6	2	11	6
Followed Activity	B,C	D,E	F	H	K	K,G	I,J	----	----	----	M	----

Solution:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	■	■	■																											
B				■	■	■																								
C				■	■	■	■	■																						
D							■	■	■	■																				
E						■	■	■	■	■																				
F								■	■	■																				
H											■	■	■																	
K											■	■	■																	
G											■	■	■	■	■	■														
I														■	■															
J														■	■	■	■	■	■	■	■	■	■	■						
M																									■	■	■	■	■	■

Project Total Duration is _30 days_   (C.P= A,B,D,H,J,M)

3

Course: construction Management
Class: 3
Lecture No.4
Prepared by: Assist. Prof. Dr. Faris Waleed Jawad

Mustansiriya University

Collage of Engineering /Water Recourse Dept.

Ex.2/ Find the project's total duration and date of completion (assume the project start date is 1 st of December 2014). Use the following details to build the Gantt chart:

Activity	A	B	C	D	G	E	F	L	I	J	M	K
Duration (weeks)	2	3	6	7	3	3	2	1	3	3	5	6
Following Activity	B,C,D	G	E	F	L	I	J	M	K	K	K	----

Solution:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A																				
B																				
C																				
D																				
G																				
E																				
F																				
L																				
I																				
J																				
M																				
K																				
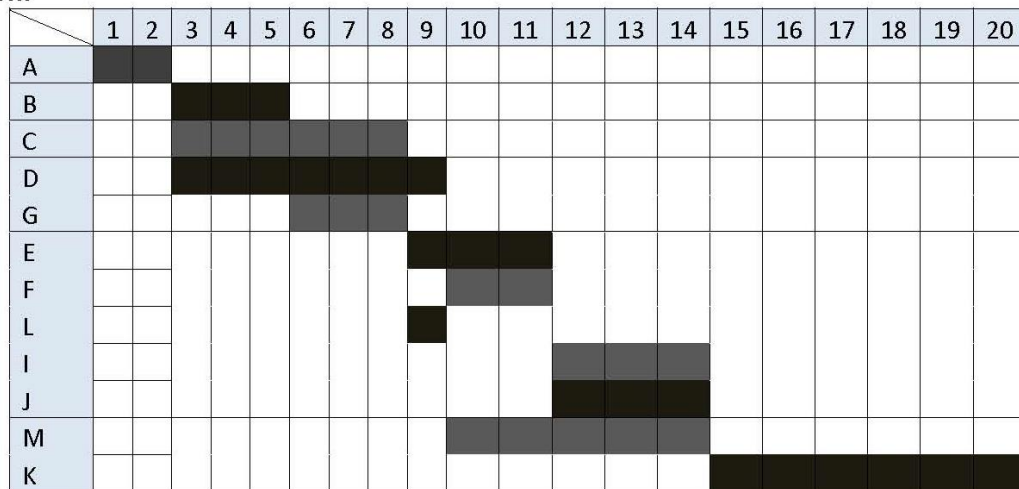
Project Total Duration is _20 weeks._ The estimated completion date is _1ˢᵗ of May 2015_ (C.P= A,D,M,K)

4

Course: construction Management
Class: 3
Lecture No.4
Prepared by: Assist. Prof. Dr. Faris Waleed Jawad

Mustansiriya University

Collage of Engineering /Water Recourse Dept.

Ex.3/ Find the project's total duration and date of completion (assume the project start date is 15th of March 2015). Use the following details to build the Gantt chart:

Activity	A	B	C	D	E	F	I	J	K	M	N	L	O
Duration (months)	3	5	3	7	10	7	11	11	7	3	4	8	7
Following Activity	B,C	E	D,F	I,J	K	I,J	M	M	L	N	----	O	-----

Solution:
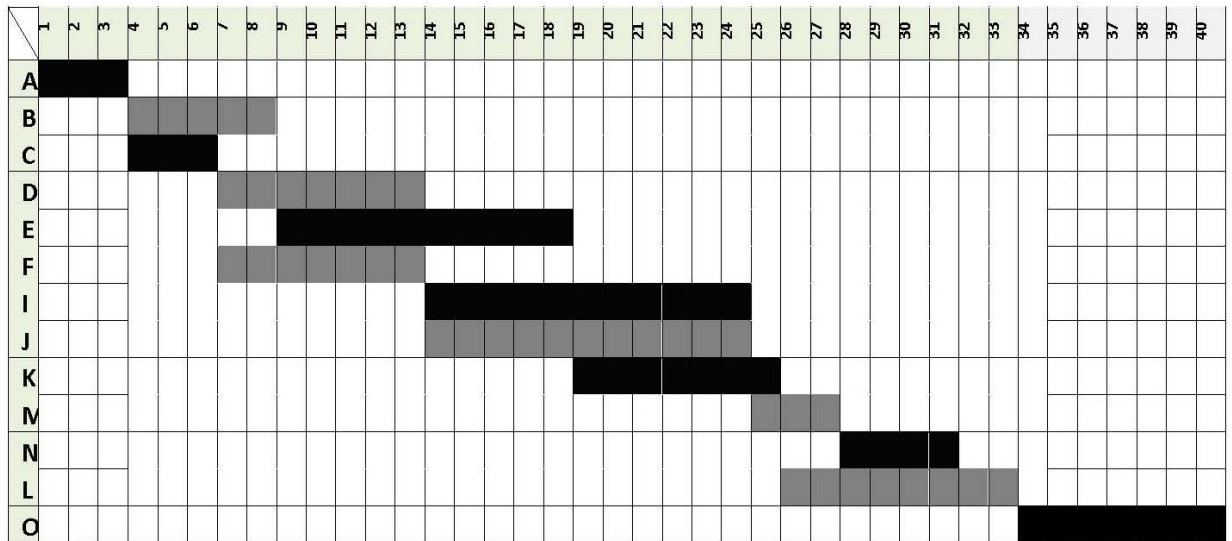
Project Total Duration is __40 months.__ The estimated completion date is __15th of July 2018__
(C.P= A,B,E,K ,L,O)

Course: construction Management
Class: 3
Lecture No.4
Prepared by: Assist. Prof. Dr. Faris Waleed Jawad

Mustansiriya University

Collage of Engineering /Water Recourse Dept.

Ex.4/ A project, its activities are shown below, was started on (20/1/2014).

Use the Gantt chart technique to find its estimated delivery date

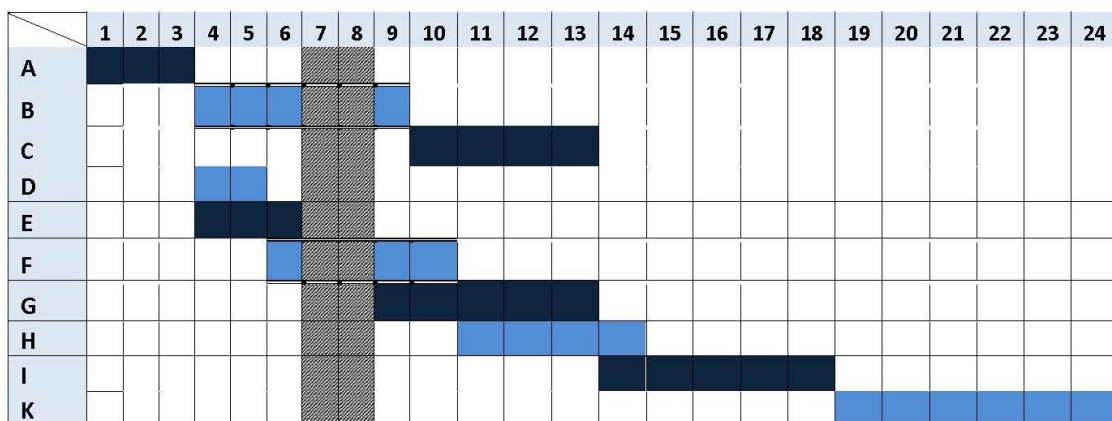| Activity	A	B	C	D	E	F	G	H	I	K
Duration (weeks)	3	4	4	2	3	3	4	4	5	6
Following Activity	B,D,E	C	I	F	G	H	I	----	K	----

Solution:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A																						
B																						
C																						
D																						
E																						
F																						
G																						
H																						
I																						
K																						
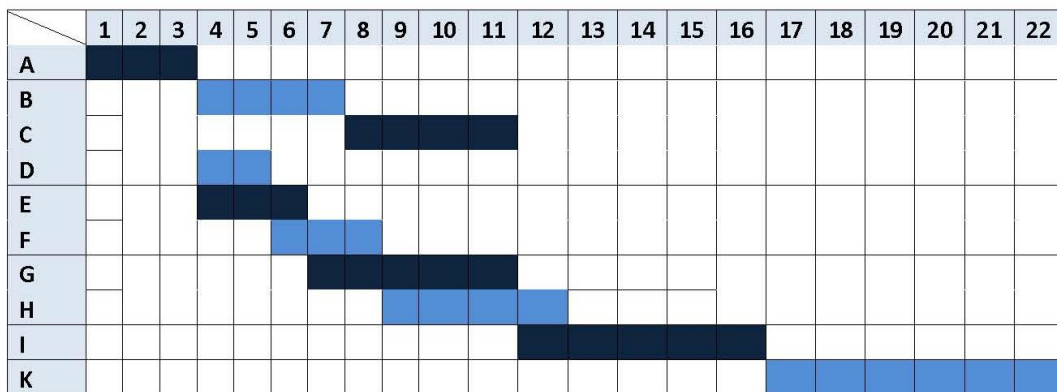
*Project Total Duration is 22 weeks. The estimated delivery date is 7/7/ 2014*
(C.P= A,B,C,I,K)

❖ **If the project shown above had a delay of (2) weeks after (6 working weeks), what would be its new delivery date?**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A																								
B																								
C																								
D																								
E																								
F																								
G																								
H																								
I																								
K																								

The project's new delivery date would be 21/7/ 2014

Course: construction Management
Class: 3
Lecture No.4
Prepared by: Assist. Prof. Dr. Faris Waleed Jawad

Mustansiriya University

Collage of Engineering /Water Recourse Dept.

Example 5:

A project to construct a fence built of bricks and cement, and according to the following plan, planning technique is required in a manner Bar Chart indicating the date of the beginning and end of each activity, as well as a statement of the total period required to complete the work.
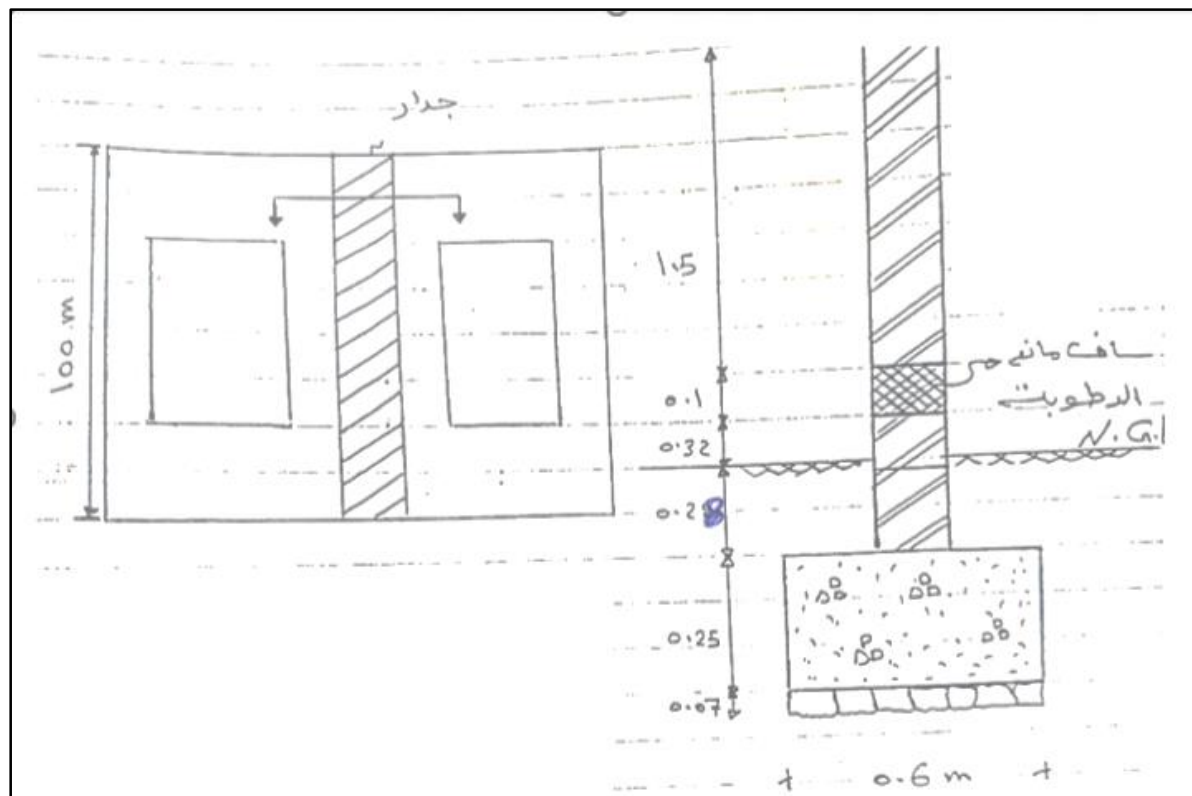
Solution:

a- Activity:

1- Planning site =100 m. L
2- Drilling of foundation= 0.6x0.6x100 = 36 m^3
3- Brushes layer under the footing= 0.6 x 100 = 60 m^2
4- Foundation casting = 0.6x 0.25x 100 = 15 m^3
5- Building with bricks and cement under moisture-block layer=0.6x0.24x100= 15m^3

Course: construction Management
Class: 3
Lecture No.4
Prepared by: Assist. Prof. Dr. Faris Waleed Jawad

Mustansiriya University

Collage of Engineering /Water Recourse Dept.

6- Pour a moisture-blocker layer = 0.24x100=24 m^2

7- Brick and cement construction over a layer of moisture block layer=1.5x100=150m^2

b- Productivity of teams for each activity

1- Planning = (Surveyor + 2 workers) = 200 m.L

2- Drilling of foundation = (10 workers) = 10m3/day

3- Brushes layer under the footing = (5 workers) = 20 m2/day

4- Foundation casting = (1 skilled worker + 8 workers) = 25 m3/day

5- Building with bricks and cement under moisture-block = (1 skilled worker + 4 workers) = 5 m3/day

6- Pour a moisture-blocker layer = (1 skilled worker + 8 workers) = 25 m2/day

7- Brick and cement construction over a layer of moisture block layer =(1 skilled worker + 4 workers) =60 m2/day

c- Duration of activity

1- Planning $= \dfrac{volume\ or\ area\ of\ activity}{productivity\ of\ teams} = \dfrac{100}{200} = 0.5 = 1$ **day**

2- Drilling of foundation $= \dfrac{36}{10} = 3.6 = 4$ **days**

3- Brushes layer under the footing = 3 days

4- Foundation casting = 1 day

5- Building with bricks and cement under moisture-block = 3 days

6- Pour a moisture-blocker layer =?

7- Brick and cement construction over a layer of moisture block layer =?

Note: homework to complete the solution of example above and deliver next week on Tuesday.

Course: construction Management
Class: 3
Lecture No.4
Prepared by: Assist. Prof. Dr. Faris Waleed Jawad

Mustansiriya University

Collage of Engineering /Water Recourse Dept.

References

- *Clark, Wallace (1922). The Gantt Chart: A Working Tool of Management. New York, NY: Ronald Press.*

- *Flouris, Triant G.; Lock, Dennis (2012). Managing Aviation Projects from Concept to Completion. Ashgate Publishing Limited. ISBN 978-1-4094-8613-8.*

- *Gantt, H.L. (1910). "Work, Wages and Profit". Engineering Magazine. New York.; republished as Work, Wages and Profits. Easton, Pennsylvania: Hive Publishing Company. 1974. ISBN 0-87960-048-9.*

- *Klein, R. (1999). Scheduling of Resource-Constrained Projects. Operations Research/Computer Science Interfaces Series. Springer US. ISBN 978-0-7923-8637-7*