

# FOLDER 7

- **Critical Path Method  
(CPM)**

# MICROSOFT PROJECT



## **PEMBANGUNAN JADUAL** **- *Critical Path Method***

# Duration

## ***Activity Duration***

- Tempoh masa yang diperlukan untuk menyiapkan sesuatu aktiviti / kerja.
- Biasanya bergantung kepada sumber dan kadar produktiviti sesuatu aktiviti /kerja.

## ***Project Duration***

- Ditentukan melalui rangkaian laluan kritikal.

# Critical Path Method

- ✘ Kaedah matematik untuk tentukan tarikh siap projek berdasarkan kepada :
  - ✘ turutan kerja (*task dependancy*) – 1M (*Method*)
  - ✘ tempoh kerja (*task duration*) – 4M (*Resources*)
- Merupakan tempoh yang paling panjang dalam network.
- Menentukan jangkamasa projek.
- Aktiviti/kerja yang berada di laluan kritikal **tidak boleh lewat** kerana akan menyebabkan projek siap lewat (total float/slack = 0).

# Critical Path Method

**Bagaimana mengenalpasti kerja-kerja kritikal di dalam MSP??**

- 1. Gantt Table**
- 2. Gantt Bar**
- 3. Total Float**

# MICROSOFT PROJECT

## Hands-On

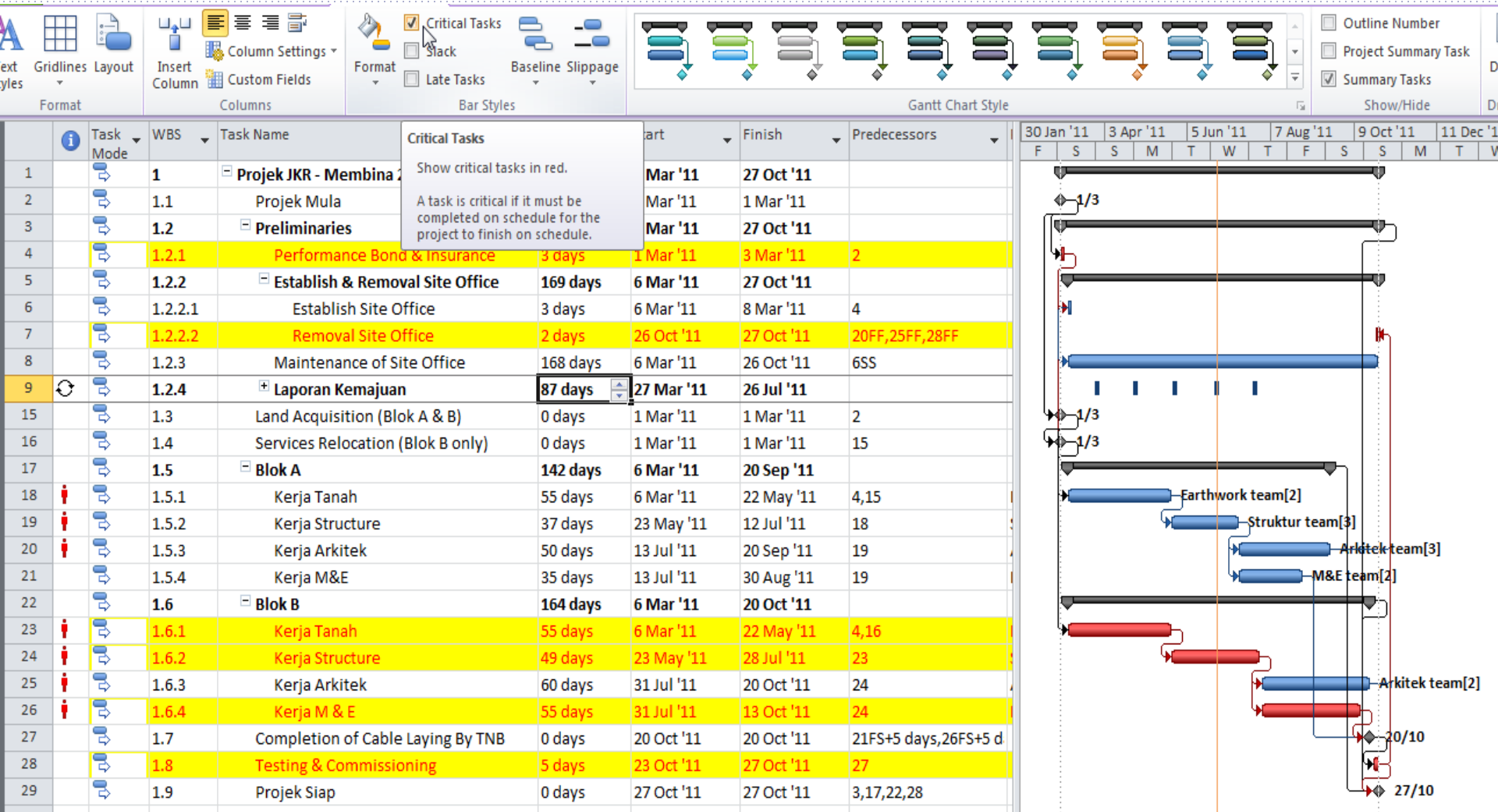


# Mengenalpasti Kerja- Kerja Kritikal (Gantt Table)

The screenshot shows the Microsoft Project interface with the 'Format' tab selected. A 'Text Styles' dialog box is open, showing settings for 'Critical Tasks'. The dialog box includes options for Font (Calibri), Font style (Regular), Size (11), Underline, Strikethrough, Color (red), Background Color (yellow), and Background Pattern (black). A sample box displays 'AaBbYyZz' in red text on a yellow background.

Task ID	Task Name	WBS	Task Mode	Duration	Start	Finish	Predecessors
1		1					
2		1.1					
3		1.2					
4		1.2.1					
5		1.2.2					
6		1.2.2.1					
7		1.2.2.2					
8		1.2.3					
9		1.2.4					
15		1.3					
16		1.4					
17		1.5		142 days	6 Mar '11	20 Sep '11	
18		1.5.1		55 days	6 Mar '11	22 May '11	4,15
19		1.5.2		37 days	23 May '11	12 Jul '11	18
20		1.5.3		50 days	13 Jul '11	20 Sep '11	19
21		1.5.4		35 days	13 Jul '11	30 Aug '11	19
22		1.6		164 days	6 Mar '11	20 Oct '11	
23		1.6.1		55 days	6 Mar '11	22 May '11	4,16
24		1.6.2		49 days	23 May '11	28 Jul '11	23
25		1.6.3		60 days	31 Jul '11	20 Oct '11	24
26		1.6.4		55 days	31 Jul '11	13 Oct '11	24
27		1.7		0 days	20 Oct '11	20 Oct '11	21FS+5 days,26FS+5 d
28		1.8		5 days	23 Oct '11	27 Oct '11	27
29		1.9		0 days	27 Oct '11	27 Oct '11	3,17,22,28

# Mengenalpasti Kerja- Kerja Kritikal (Gantt Bar)



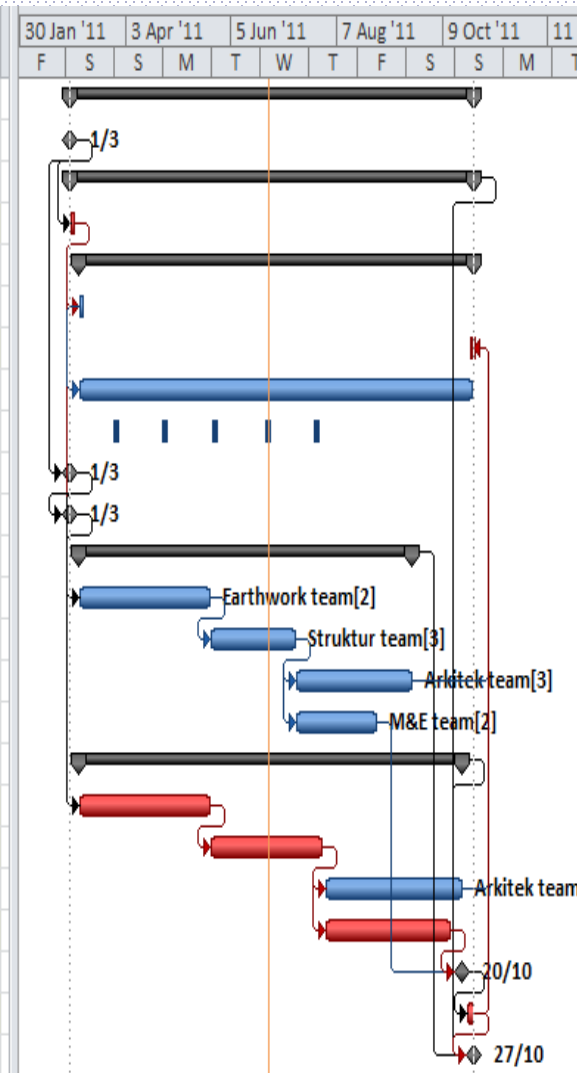


# Mengenalpasti Kerja- Kerja Kritikal (Total Float)

	WBS	Task Name	Duration	Start	Finish	Predecessors	Resource Names	task Calendar	Ad
1	1	Projek JKR - Membina 2 blok bangunan	172 days	1 Mar '11	27 Oct '11			Task Calendar	
2	1.1	Projek Mula	0 days	1 Mar '11	1 Mar '11			Task Calendar GUID	
3	1.2	Preliminaries	172 days	1 Mar '11	27 Oct '11			Task Mode	
4	1.2.1	Performance Bond & Insurance	3 days	1 Mar '11	3 Mar '11	2		TCPI	
5	1.2.2	Establish & Removal Site Office	169 days	6 Mar '11	27 Oct '11			TeamStatus Pending	
6	1.2.2.1	Establish Site Office	3 days	6 Mar '11	8 Mar '11	4		Text1	
7	1.2.2.2	Removal Site Office	2 days	26 Oct '11	27 Oct '11	20FF,25FF,28F		Text10	
8	1.2.3	Maintenance of Site Office	168 days	6 Mar '11	26 Oct '11	6SS		Text11	
9	1.2.4	Laporan Kemajuan	87 days	27 Mar '11	26 Jul '11			Text12	
15	1.3	Land Acquisition (Blok A & B)	0 days	1 Mar '11	1 Mar '11	2		Text13	
16	1.4	Services Relocation (Blok B only)	0 days	1 Mar '11	1 Mar '11	15		Text14	
17	1.5	Blok A	142 days	6 Mar '11	20 Sep '11			Text15	
18	1.5.1	Kerja Tanah	55 days	6 Mar '11	22 May '11	4,15	Earthwork team	Text16	
19	1.5.2	Kerja Structure	37 days	23 May '11	12 Jul '11	18	Struktur team[3]	Text17	
20	1.5.3	Kerja Arkitek	50 days	13 Jul '11	20 Sep '11	19	Arkitek team[3]	Text18	
21	1.5.4	Kerja M&E	35 days	13 Jul '11	30 Aug '11	19	M&E team[2]	Text19	
22	1.6	Blok B	164 days	6 Mar '11	20 Oct '11			Text20	
23	1.6.1	Kerja Tanah	55 days	6 Mar '11	22 May '11	4,16	Earthwork team	Text21	
24	1.6.2	Kerja Structure	49 days	23 May '11	28 Jul '11	23	Struktur team[3]	Text22	
25	1.6.3	Kerja Arkitek	60 days	31 Jul '11	20 Oct '11	24	Arkitek team[2]	Text23	
26	1.6.4	Kerja M & E	55 days	31 Jul '11	13 Oct '11	24	M & E team[2]	Text24	
27	1.7	Completion of Cable Laying By TNB	0 days	20 Oct '11	20 Oct '11	21FS+5 days,2		Text25	
28	1.8	Testing & Commissioning	5 days	23 Oct '11	27 Oct '11	27		Text26	
29	1.9	Projek Siap	0 days	27 Oct '11	27 Oct '11	3,17,22,28		Text27	
								Text28	
								Text29	
								Text30	
								Text3	
								Text4	
								Text5	
								Text6	
								Text7	
								Text8	
								Text9	
								Total Slack	
								Type	

# Critical Path Method

ID	Task Mode	WBS	Task Name	Duration	Start	Finish	Predecessor	Resource Names	Total Slack
1		1	Projek JKR - Membina 2 blok bangunan	172 days	1 Mar '11	27 Oct '11			0 days
2		1.1	Projek Mula	0 days	1 Mar '11	1 Mar '11			0 days
3		1.2	Preliminaries	172 days	1 Mar '11	27 Oct '11			0 days
4		1.2.1	Performance Bond & Insurance	3 days	1 Mar '11	3 Mar '11	2		0 days
5		1.2.2	Establish & Removal Site Office	169 days	6 Mar '11	27 Oct '11			0 days
6		1.2.2.1	Establish Site Office	3 days	6 Mar '11	8 Mar '11	4		1 day
7		1.2.2.2	Removal Site Office	2 days	26 Oct '11	27 Oct '11	20FF,25FF,28F		0 days
8		1.2.3	Maintenance of Site Office	168 days	6 Mar '11	26 Oct '11	6SS		1 day
9		1.2.4	Laporan Kemajuan	87 days	27 Mar '11	26 Jul '11			67 days
15		1.3	Land Acquisition (Blok A & B)	0 days	1 Mar '11	1 Mar '11	2		3 days
16		1.4	Services Relocation (Blok B only)	0 days	1 Mar '11	1 Mar '11	15		3 days
17		1.5	Blok A	142 days	6 Mar '11	20 Sep '11			27 days
18		1.5.1	Kerja Tanah	55 days	6 Mar '11	22 May '11	4,15	Earthwork team[2]	27 days
19		1.5.2	Kerja Structure	37 days	23 May '11	12 Jul '11	18	Struktur team[3]	27 days
20		1.5.3	Kerja Arkitek	50 days	13 Jul '11	20 Sep '11	19	Arkitek team[3]	27 days
21		1.5.4	Kerja M&E	35 days	13 Jul '11	30 Aug '11	19	M&E team[2]	32 days
22		1.6	Blok B	164 days	6 Mar '11	20 Oct '11			0 days
23		1.6.1	Kerja Tanah	55 days	6 Mar '11	22 May '11	4,16	Earthwork team[3]	0 days
24		1.6.2	Kerja Structure	49 days	23 May '11	28 Jul '11	23	Struktur team[3]	0 days
25		1.6.3	Kerja Arkitek	60 days	31 Jul '11	20 Oct '11	24	Arkitek team[2]	5 days
26		1.6.4	Kerja M & E	55 days	31 Jul '11	13 Oct '11	24	M & E team[2]	0 days
27		1.7	Completion of Cable Laying By TNB	0 days	20 Oct '11	20 Oct '11	21FS+5 days,2		0 days
28		1.8	Testing & Commissioning	5 days	23 Oct '11	27 Oct '11	27		0 days
29		1.9	Projek Siap	0 days	27 Oct '11	27 Oct '11	3,17,22,28		0 days



# Total Float (-ve)??

	i	Task Mode	WBS	Task Name	Duration	Start	Finish	Predecessors	Resource Names	Total Slack
1			1	Projek JKR - Membina 2 blok bangunan	172 days	1 Mar '11	27 Oct '11			-42 days
2			1.1	Projek Mula	0 days	1 Mar '11	1 Mar '11			-42 days
3			1.2	Preliminaries	172 days	1 Mar '11	27 Oct '11			-42 days
4			1.2.1	Performance Bond & Insurance	3 days	1 Mar '11	3 Mar '11	2		-42 days
5			1.2.2	Establish & Removal Site Office	169 days	6 Mar '11	27 Oct '11			0 days
6			1.2.2.1	Establish Site Office	3 days	6 Mar '11	8 Mar '11	4		1 day
7			1.2.2.2	Removal Site Office	2 days	26 Oct '11	27 Oct '11	20FF,25FF,28F		0 days
8			1.2.3	Maintenance of Site Office	168 days	6 Mar '11	26 Oct '11	6SS		1 day
9	↺		1.2.4	Laporan Kemajuan	87 days	27 Mar '11	26 Jul '11			67 days
15			1.3	Land Acquisition (Blok A & B)	0 days	1 Mar '11	1 Mar '11	2		-39 days
16			1.4	Services Relocation (Blok B only)	0 days	1 Mar '11	1 Mar '11	15		-39 days
17			1.5	Blok A	142 days	6 Mar '11	20 Sep '11			-10 days
18	🚫		1.5.1	Kerja Tanah	55 days	6 Mar '11	22 May '11	4,15	Earthwork team[2]	-10 days
19	🚫		1.5.2	Kerja Structure	37 days	23 May '11	12 Jul '11	18	Struktur team[3]	-10 days
20	🚫		1.5.3	Kerja Arkitek	50 days	13 Jul '11	20 Sep '11	19	Arkitek team[3]	27 days
21			1.5.4	Kerja M&E	35 days	13 Jul '11	30 Aug '11	19	M&E team[2]	-10 days
22			1.6	Blok B	164 days	6 Mar '11	20 Oct '11			-42 days
23	🚫		1.6.1	Kerja Tanah	55 days	6 Mar '11	22 May '11	4,16	Earthwork team[3]	-42 days
24	🚫		1.6.2	Kerja Structure	49 days	23 May '11	28 Jul '11	23	Struktur team[3]	-42 days
25	🚫		1.6.3	Kerja Arkitek	60 days	31 Jul '11	20 Oct '11	24	Arkitek team[2]	5 days
26	🚫		1.6.4	Kerja M & E	55 days	31 Jul '11	13 Oct '11	24	M & E team[ ]	-42 days
27			1.7	Completion of Cable Laying By TNB	0 days	20 Oct '11	20 Oct '11	21FS+5 days,2		-42 days
28			1.8	Testing & Commissioning	5 days	23 Oct '11	27 Oct '11	27		-42 days
29			1.9	Projek Siap	0 days	27 Oct '11	27 Oct '11	3,17,22,28		-42 days

# Latihan 3 : Penyediaan CPM



# Penyediaan CPM

ES	Dur	EF
Name		
LS	Total Slack	LF

× 2 Kaedah :

- **Forward Pass**

- untuk dapatkan ES @ EF

$$EF = ES + Dur - 1$$

- **Backward Pass**

- Untuk dapatkan LS @ LF

$$LS = LF - Dur + 1$$



# Penyediaan CPM

Aktiviti	Duration	Successor	Predecessor
Projek Mula		A	
A	5	B,C,D	Projek Mula
B	6	E,F	A
C	7	E,F	A
D	4	F,G	A
E	3	H	B,C
F	4	H,I	B,C,D
G	5	I	D
H	4	J	E,F
I	6	J	F,G
J	3	Projek Siap	H,I
Projek Siap			

# Penyediaan CPM

## ✘ Maklumat projek :

- Tarikh mula projek : 1 Ogos
- Waktu bekerja : 8 pagi hingga 5 petang
- Tiada cuti

## ✘ Soalan :

- Apakah tarikh siap projek ?
- Berapa bilangan kerja-kerja kritikal?
- Berapa bilangan laluan kritikal?

# Total Float / Slack

- Tempoh masa yang dibenarkan untuk *delay* tanpa menjejaskan tarikh siap projek.
- Total Float = 0 → kerja kritikal
- Total Float > 0 → kerja tidak kritikal
- Total Float < 0 → kerja kritikal (tidak cukup masa)

• Total Float :

$$TS = LF - EF @ LS - ES$$