Project Time Management Schedule for Developing Electronic Toll Collection (ETC): An Automated Toll Collection System

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Course Name : Software Project Management (CSE6301)

This is the time management report for the project named Automated Toll Collection System where the estimated project start date is at the End of October 2023 and tentative project completion date is on August 2024. This report demonstrated the required project deliverables, key activities for specific processes, dependencies among activities, Gantt chart for the activities, critical path and the slack time for the project.

1. Project Deliverables

All project deliverables will be managed and overseen by the project manager directly. The core deliverables for this project are:

	Deliverables	Description
1.	System Requirements Document	A document outlining the functional and non-functional requirements of the system, such as tag detection accuracy, transaction processing time, and backend database capacity.
2.	System Architecture Design	An architectural design diagram that illustrates how the various components of the system will interact and work together, such as RFID readers, toll gates, backend servers, and databases.
3.	User Interface Design	Prototypes or mock-ups of the user interface that will be used by toll operators to manage and monitor the system, as well as interfaces for end-users, such as vehicle drivers.
4.	Hardware Implementation	Implementation of hardware components for the system, including RFID readers, antennas, toll gate mechanisms, sensors, and other relevant equipment.
5.	Software Implementation	Implementation of software components required for the system, including the toll collection application, database management system, backend server software, and any supporting middleware.
6.	Testing and Validation	- Test Plan: A document outlining the testing approach, test cases, and expected results. - Test Reports: Reports summarizing the results of

		various testing activities, including functional, performance, and integration testing.
7.	Deployment and Installation	- Deployment Plan: A document detailing the steps and requirements for deploying the system in toll plazas. - Installation Guides: Step-by-step instructions for installing and configuring the hardware and software components.
8.	Maintenance and Support	- Maintenance Plan: A plan describing ongoing support, bug fixes, and system enhancements. - Support Channel: A dedicated communication channel (e.g., email, ticketing system) for users to report issues and receive technical assistance

2. Project Activities

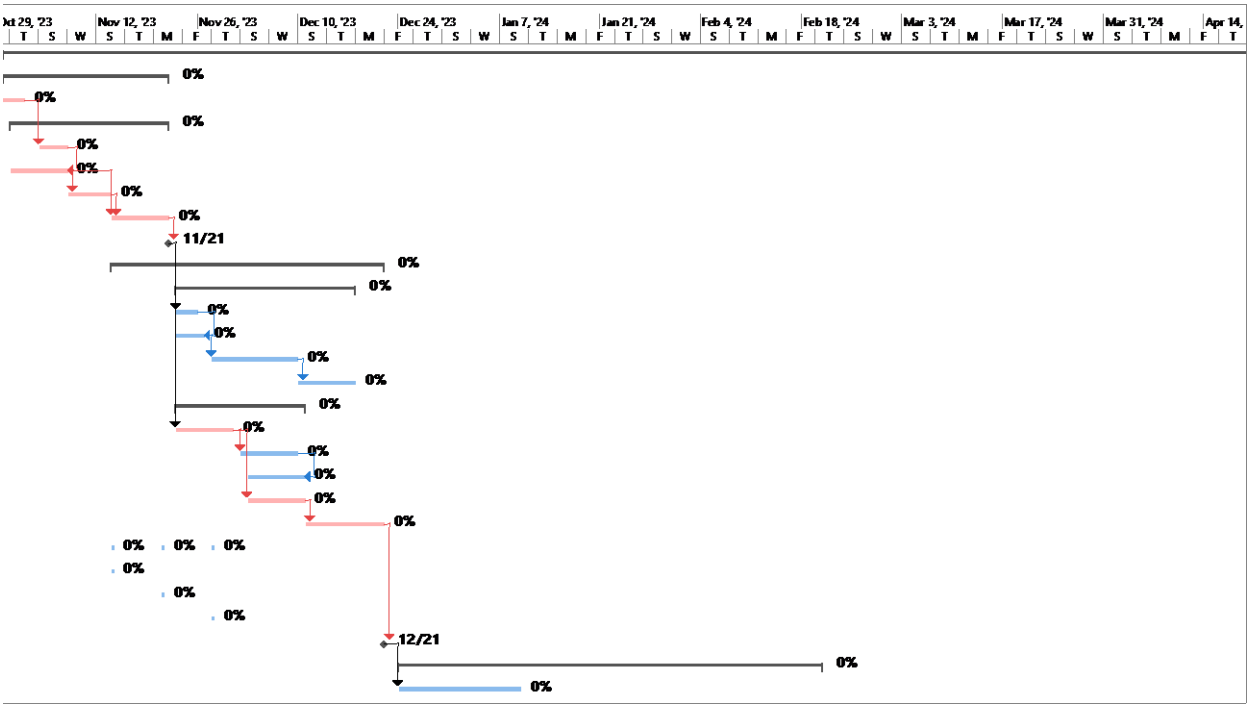
The major activities of each phase have been implemented with the help of previously created work breakdown structure by using Microsoft Project 2013. For all activities, the duration time of each activity has been assumed and then auto scheduled them.

	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Automated Toll Collection System**	**240 days**	**Mon 10/30/2**	**Sun 8/4/24**	
2		**Concept**	**20 days**	**Mon 10/30/2**	**Tue 11/21/23**	
3		Evaluate Current System	3 days	Mon 10/30/23	Wed 11/1/23	
4		**Define Requirements**	**19 days**	**Tue 10/31/23**	**Tue 11/21/23**	
5		User Requirements	4 days	Sat 11/4/23	Tue 11/7/23	3FS+1 day
6		System Requirements	7 days	Tue 10/31/23	Tue 11/7/23	5FF
7		Service Requirements	5 days	Wed 11/8/23	Mon 11/13/23	6
8		Operational Requirements	7 days	Tue 11/14/23	Tue 11/21/23	7,6
9		Concept Completed	0 days	Tue 11/21/23	Tue 11/21/23	8
10		**System Design**	**33 days**	**Tue 11/14/23**	**Thu 12/21/23**	
11		**Hardware Components**	**21 days**	**Thu 11/23/23**	**Sun 12/17/23**	
12		RFID Readers	2 days	Thu 11/23/23	Sat 11/25/23	9FS+1 day
13		Antennas	3 days	Thu 11/23/23	Sun 11/26/23	12FF+1 day
14		Toll Gate Mechanism	10 days	Tue 11/28/23	Sat 12/9/23	13FS+1 day
15		Sensors	7 days	Sun 12/10/23	Sun 12/17/23	14

16			**Software Components**	**15 days**	**Thu 11/23/23**	**Sun 12/10/23**	
17			Toll Collection Application	7 days	Thu 11/23/23	Thu 11/30/23	9FS+1 day
18			DBMS	7 days	Sat 12/2/23	Sat 12/9/23	17
19			Backend Server	7 days	Sun 12/3/23	Sun 12/10/23	18FF+1 day
20			Database Design	7 days	Sun 12/3/23	Sun 12/10/23	17FS+1 day
21			User Interface Design	10 days	Mon 12/11/23	Thu 12/21/23	20
22			**System Design Review**	**12.13 days**	**Tue 11/14/23**	**Tue 11/28/23**	
23			System Design Review 1	1 hr	Tue 11/14/23	Tue 11/14/23	
24			System Design Review 2	1 hr	Tue 11/21/23	Tue 11/21/23	
25			System Design Review 3	1 hr	Tue 11/28/23	Tue 11/28/23	
26			System Design Completed	0 days	Thu 12/21/23	Thu 12/21/23	21

Here is a sample snapshot of MS project, where I have implemented necessary activities and task of this project. The time duration has defined for each phase and task dependencies are specified according to Precedence Diagramming Method (PDM). Also, I have added recurring task for specific phases and one is shown in the snapshot (Task Id. 22). And milestone is added to each phase for better tracking the project schedule. The entire project schedule given in attached project file.

3. Gantt Chart



Here is a sample snapshot of Gantt chart that actually represent the project timeline according to the individual task involve in each phase. This Gantt chart can be automatically generated by using MS project software. Here the blue and red bars are actually represent task involved in this project (requirement collection, database design, UI design, hardware implementation etc.) where blue bars are represent the non-critical task and red bars are critical task. And the aero between the task that connected them actually represent the dependecies between them. And the path that is marked as red is called critical path that

means this longest path duration is the actual minumum the duration to finish this project. The entire Gantt chart is available at the attached project file.

4. Slack Times

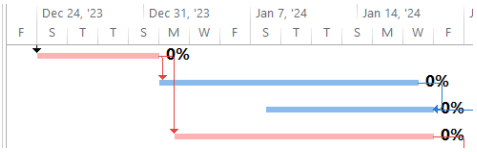
The slack time of each activities can be calculated by using MS project software. We can simply added the required column (Early Start, Early Finish, Late Start, Late Finish, Total Slack, Free Slack) to identify the slack time for each activities. From the task sheet view, we can simply see the necessary duration and slack times.

	Task	Task Name	Duration	Start	Finish	Predecessors	Early Start	Early Finish	Late Start	Late Finish	Free Slack	Total Slack
1		**Automated Toll Collection System**	**240 days**	**Mon 10/30/2**	**Sun 8/4/24**		**Mon 10/30/23**	**Sun 8/4/24**	**Mon 10/30/23**	**Sun 8/4/24**	**0 days**	**0 days**
2		**Concept**	**20 days**	**Mon 10/30/2**	**Tue 11/21/23**		**Mon 10/30/23**	**Tue 11/21/23**	**Mon 10/30/23**	**Wed 11/22/23**	**0 days**	**0 days**
3		Evaluate Current System	3 days	Mon 10/30/2:	Wed 11/1/23		Mon 10/30/23	Wed 11/1/23	Mon 10/30/23	Wed 11/1/23	0 days	0 days
4		**Define Requirements**	**19 days**	**Tue 10/31/23**	**Tue 11/21/23**		**Tue 10/31/23**	**Tue 11/21/23**	**Tue 10/31/23**	**Tue 11/21/23**	**0 days**	**0 days**
5		User Requirements	4 days	Sat 11/4/23	Tue 11/7/23	3FS+1 day	Sat 11/4/23	Tue 11/7/23	Sat 11/4/23	Tue 11/7/23	0 days	0 days
6		System Requirements	7 days	Tue 10/31/23	Tue 11/7/23	5FF	Tue 10/31/23	Tue 11/7/23	Tue 10/31/23	Tue 11/7/23	0 days	0 days
7		Service Requirements	5 days	Wed 11/8/23	Mon 11/13/2:	6	Wed 11/8/23	Mon 11/13/23	Wed 11/8/23	Mon 11/13/23	0 days	0 days
8		Operational Requirements	7 days	Tue 11/14/23	Tue 11/21/23	7,6	Tue 11/14/23	Tue 11/21/23	Tue 11/14/23	Tue 11/21/23	0 days	0 days
9		Concept Completed	0 days	Tue 11/21/23	Tue 11/21/23	8	Tue 11/21/23	Tue 11/21/23	Wed 11/22/23	Wed 11/22/23	0 days	0 days
10		**System Design**	**33 days**	**Tue 11/14/23**	**Thu 12/21/23**		**Tue 11/14/23**	**Thu 12/21/23**	**Thu 11/23/23**	**Sun 8/4/24**	**8 days**	**8 days**
11		**Hardware Components**	**21 days**	**Thu 11/23/23**	**Sun 12/17/23**		**Thu 11/23/23**	**Sun 12/17/23**	**Thu 7/11/24**	**Sun 8/4/24**	**198 days**	**198 days**
12		RFID Readers	2 days	Thu 11/23/23	Sat 11/25/23	9FS+1 day	Thu 11/23/23	Sat 11/25/23	Thu 7/11/24	Sat 7/13/24	0 days	198 days
13		Antennas	3 days	Thu 11/23/23	Sun 11/26/23	12FF+1 day	Thu 11/23/23	Sun 11/26/23	Thu 7/11/24	Sun 7/14/24	0 days	198 days
14		Toll Gate Mechanism	10 days	Tue 11/28/23	Sat 12/9/23	13FS+1 day	Tue 11/28/23	Sat 12/9/23	Tue 7/16/24	Sat 7/27/24	0 days	198 days
15		Sensors	7 days	Sun 12/10/23	Sun 12/17/23	14	Sun 12/10/23	Sun 12/17/23	Sun 7/28/24	Sun 8/4/24	198 days	198 days
16		**Software Components**	**15 days**	**Thu 11/23/23**	**Sun 12/10/23**		**Thu 11/23/23**	**Sun 12/10/23**	**Thu 11/23/23**	**Sun 8/4/24**	**0 days**	**0 days**
17		Toll Collection Application	7 days	Thu 11/23/23	Thu 11/30/23	9FS+1 day	Thu 11/23/23	Thu 11/30/23	Thu 11/23/23	Thu 11/30/23	0 days	0 days
18		DBMS	7 days	Sat 12/2/23	Sat 12/9/23	17	Sat 12/2/23	Sat 12/9/23	Sat 7/27/24	Sat 8/3/24	0 days	204 days
19		Backend Server	7 days	Sun 12/3/23	Sun 12/10/23	18FF+1 day	Sun 12/3/23	Sun 12/10/23	Sun 7/28/24	Sun 8/4/24	204 days	204 days
20		Database Design	7 days	Sun 12/3/23	Sun 12/10/23	17FS+1 day	Sun 12/3/23	Sun 12/10/23	Sun 12/3/23	Sun 12/10/23	0 days	0 days
21		User Interface Design	10 days	Mon 12/11/2:	Thu 12/21/23	20	Mon 12/11/23	Thu 12/21/23	Mon 12/11/23	Thu 12/21/23	0 days	0 days
22		**System Design Review**	**12.13 days**	**Tue 11/14/23**	**Tue 11/28/23**		**Tue 11/14/23**	**Tue 11/28/23**	**Sun 8/4/24**	**Sun 8/4/24**	**214.88 days**	**214.88 days**
23		System Design Review 1	1 hr	Tue 11/14/23	Tue 11/14/23		Tue 11/14/23	Tue 11/14/23	Sun 8/4/24	Sun 8/4/24	1815 hrs	1815 hrs
24		System Design Review 2	1 hr	Tue 11/21/23	Tue 11/21/23		Tue 11/21/23	Tue 11/21/23	Sun 8/4/24	Sun 8/4/24	1767 hrs	1767 hrs
25		System Design Review 3	1 hr	Tue 11/28/23	Tue 11/28/23		Tue 11/28/23	Tue 11/28/23	Sun 8/4/24	Sun 8/4/24	1719 hrs	1719 hrs
26		System Design Completed	0 days	Thu 12/21/23	Thu 12/21/23	21	Thu 12/21/23	Thu 12/21/23	Sat 12/23/23	Sat 12/23/23	0 days	0 days
27		**Hardware Implementation**	**51 days**	**Sun 12/24/23**	**Tue 2/20/24**		**Sun 12/24/23**	**Tue 2/20/24**	**Thu 6/6/24**	**Sun 8/4/24**	**142 days**	**142 days**
28		RFID Reader & Antennas Installat	15 days	Sun 12/24/23	Tue 1/9/24	26FS+1 day	Sun 12/24/23	Tue 1/9/24	Thu 6/6/24	Sun 6/23/24	0 days	142 days
29		**RFID Tag Deployement**	**15 days**	**Mon 12/25/2**	**Wed 1/10/24**		**Mon 12/25/23**	**Wed 1/10/24**	**Sat 6/8/24**	**Mon 6/24/24**	**142 days**	**142 days**
30		Vehicle Classification	15 days	Mon 12/25/2:	Wed 1/10/24	28FF+1 day	Mon 12/25/23	Wed 1/10/24	Sat 6/8/24	Mon 6/24/24	0 days	142 days
31		Wiring & Connectivity Setup	20 days	Thu 1/11/24	Sat 2/3/24	30	Thu 1/11/24	Sat 2/3/24	Tue 6/25/24	Wed 7/17/24	0 days	142 days

NEW TASKS : MANUALLY SCHEDULED

Total slack is the difference between late start and early start or difference between late finish and early finish. And free slack is the difference between early start of successor activity and early finish of current activity. Now, if there is no slack between the activities that means those tasks are lies on the critical path. Cause if there is no leads or lag among the tasks where (ES=LS or EF=LF) that means there is no slack, and the tasks will form a critical path.

	Late Start	Late Finish	Free Slack	Total Slack
36	Sun 12/24/23	Sun 12/31/23	0 days	0 days
37	Thu 7/4/24	Sun 7/21/24	0 days	159 days
38	Thu 7/11/24	Mon 7/22/24	48 days	159 days
39	Tue 1/2/24	Thu 1/18/24	0 days	0 days



In this project, Task Id. 36 and 39 involved under critical path where their free slack and total slack is 0, and the rest of two are not equal to 0. That means the tasks are involved in the critical path has no difference between their duration times and the tasks needs to be done on time. Slack times for all the activities are added on task sheet available at attached project file.