

MT - Next Wed @ 10 am. What is on it? Everything  
 M/C anything mentioned in Lecture  
 Lectures  
 Ass  
 Labs ...

# ECSE-211

## Design Principles and Methods

Lecture 9: Designing the Timeline and Project Management

Date: 8 February 2023

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## From the Last Lecture

- Question 1
- Why is a Gantt Chart (or equivalent) used in a design project?

Time line. - scheduling

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## Question 2

- Why should a test document be sent to project management?

*project management has the final decision on whether to redesign.*

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## Question 3

- In DPM, why should integration testing be started about 2 weeks before the delivery date?

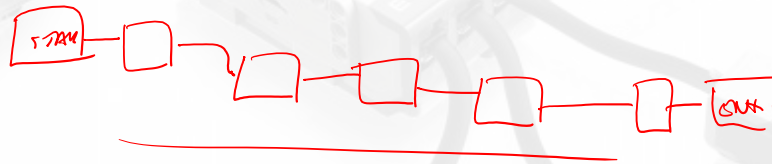
*— test for component interference - .  
and allow time for redesign*

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## Question 4

- What is a Critical Path?

*longest path of dependencies*



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## Contents

- Estimation and Planning ←
- Jobs and Responsibilities for the DPM project ←
- The timeline – key dates —
- GanttProject – an open source Project Management Tool }
- Listing the tasks and dependencies —
- Building the initial Chart —

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## Estimation and Planning

- So – a list of tasks to achieve each milestone has been determined
- But – to develop a Gantt Chart and determine the Critical Path, the time taken for each task needs estimating
- Also, the work needed for each task needs determining – this affects the budget
- Questions:
  - How long will a task take? ✓
  - What resources will it need? ✓
  - How many people? ✓
  - Can more people reduce the time? Would this change the cost?

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## How do you Estimate the Time Needed to Complete a Task?

- Experience ✓ ?
- General metrics – for example estimate the lines of code needed for a task and then the number of lines per person per day.
- Generate a “most likely time”, an “optimistic time” and a “pessimistic time”
- Combine the estimates into an “expected time” - the average time a task would take if it were repeated on a number of occasions. E.g.
  - $T_E = (O + 4M + P) \div 6$
- Note that this also will depend on how many people are allocated

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## What about Agile?

- Agile is heavily used in Software Development – but not so much in hardware.... Why?
- The Agile Manifesto
  - Early and continuous delivery of valuable software ✓✓
  - Welcome changing requirements – even late in development ✓
  - Deliver working software frequently – on a “weeks” timescale ✓
  - Management and developers work together daily ✓
  - Projects built around motivated individuals ✓
  - The most effective and efficient method of information transfer is face to face ✓
  - Progress is measured by working software ✓
  - Maintain constant development pace indefinitely ✓
  - Continuous attention to excellence and good design enhances agility ✓
  - Simplicity ✓
  - Self organizing teams ✓
  - Teams modify behaviour regularly based on becoming more effective ✓

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## Can Agile work for hardware?

- While a partial software product may work and achieve some of the goals of a design, partial hardware is difficult.
- Hardware is constructed from physical components
  - The components work together to build a system
  - There is a sequence to developing components
  - Components cannot be continually modified if their construction requires manufacturing processes
    - In hardware, the prototype is almost always replaced with production models
    - In software, the prototype evolves to become the production model
- So – in an embedded system (a combination of hardware and software), some parts may be manageable with an Agile process – others will need a more waterfall approach.

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## Project Management/Implementation

- To implement a task needs *resources*
- Resources are:
  - People with skills/job descriptions ✓
  - Tools – e.g. software environments, hardware ✓
  - Laboratory/Test environment ✓

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## The Design Team Organization

- Each team has 6 or ~~5~~ members
- Each team member has at least one primary responsibility and may have several minor ones.
- Each team has been built to have a mixture of skills to provide the range of capabilities needed to solve the design problem.

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## Design Team Organization 2

- There are several key roles (jobs) to be allocated in the team:
  - Design Team Manager
  - Design Documentation Manager
  - Hardware Team Leader
  - Software Team Leader
  - Testing Team Leader

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## Jobs and Responsibilities 1

- Design Team Manager
  - The primary manager for the project
  - Main role is project management
  - Designs, creates and maintains the Gantt Chart
  - Maintains the global time sheet
  - Tracks the budget
  - Allocates main responsibilities for each task on the chart
  - Resolves disputes within the team
  - Makes primary design decisions based on team discussions
  - In consultation with the Documentation Manager provides the documents for weekly meetings
  - Tracks and manages the integration of the hardware and software components

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## Jobs and Responsibilities 2

- Design Documentation Manager
  - Works as the deputy to the Team Manager
  - Is in charge of all the documentation tasks
  - Tracks all the documentation in the system
  - Allocates documentation tasks to members of the team and passes these allocations back to the team manager for the Gantt chart
  - Specifies and implements the formats for all documents
  - Ensures that it is possible to recreate any milestone point in the project

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## Jobs and Responsibilities 3

- Hardware Team Leader
  - In charge of the hardware design
  - In consultation with the Team Manager specifies the task breakdown for the hardware systems
  - In consultation with the Documentation Manager, defines the documentation structures to be used
  - Tracks progress on the tasks and reports problems to the Team Manager
  - Manages the hardware engineering team – allocates resources to tasks and informs the Team Manager

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## Jobs and Responsibilities 4

- **Software Team Leader**

- In charge of the software design
- In consultation with the Team Manager specifies the task breakdown for the software systems
- In consultation with the Documentation Manager, defines the documentation structures to be used
- Implements source code control system to be used
- Tracks progress on the tasks and reports problems to the Team Manager
- Manages the software engineering team – allocates resources to tasks and informs the Team Manager

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## Jobs and Responsibilities 5

- **Testing Team Leader**

- In charge of the test system design
- From the initial requirements documents, specifies and designs the final acceptance tests
- In consultation with the Team Manager specifies the tests to be performed at each milestone and defines acceptable performance
- In consultation with the Documentation Manager, defines the test document formats to be used
- Implements a tracking system for the tests performed and documented
- Ensures that test reports are distributed to the appropriate managers and individuals
- Manages the test team – allocates resources to tasks and informs the Team Manager

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## Jobs and Responsibilities 6

- **Hardware Engineer**
  - Part of the hardware design team
  - Works with the Hardware Team Manager to design the hardware components to meet the requirements
  - Documents work done in the hardware area
  - Assists the Hardware Team Manager in task definition and scheduling
  - Constructs the hardware

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## Jobs and Responsibilities 7

- **Software Engineer**
  - Part of the software design team
  - Works with the Software Team Manager to design the software components to meet the requirements
  - Documents work done in the software area
  - Assists the Software Team Manager in task definition and scheduling
  - Constructs the software

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## Jobs and Responsibilities 8

- Test Engineer
  - Part of the test procedure design team
  - Works with the Testing Team Manager to design the tests for each milestone and acceptance tests derived from the requirements
  - Documents all tests performed during the project
  - Assists the Testing Team Manager in task definition and scheduling
  - Implements the tests and records the results
  - Works with the Testing Team Manager to distribute the test results to the appropriate people in the design team

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## Team Organization

- Note that there may be several hardware engineers in the hardware team, several software engineers in the software team and several test engineers in the test team
- Each member of the team may have multiple roles.
- The members of the team are the Resources for the project and must be allocated to tasks in the Gantt chart by the Team Manager.

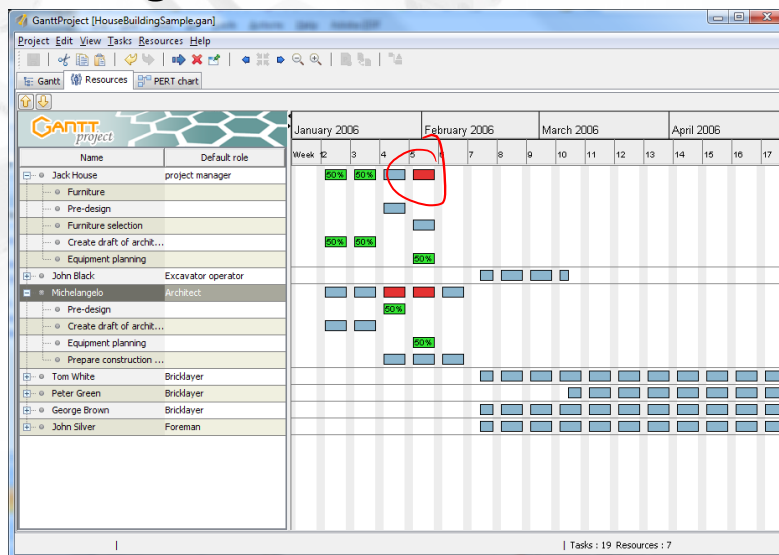
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## Team Organization

- For this to work, everyone needs to understand their role(s) within the team
- There is no “I” in TEAM!
- For the team to be able to function, everyone should be treated with respect and this is not only part of the Team Manager’s main role but is the responsibility of all the members.

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## Resource Usage



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## The Project

- Available in the Lecture on 20 February
- Start Monday, 20 February
  - Identify the problem, set up the tasks, identify the resources, complete the documents
- Milestones?
  - 8 March– initial mechanical design, software architecture, first presentations (Milestone 0)
  - 15 March– Mechanical design complete, initial software running (Milestone 1)
  - 29 March – Last round of presentations
  - 12 April – Final Design Demonstration

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## Prior to Constructing the Gantt Chart

- 1. Determine the tasks necessary to complete the task.
- 2. What are the properties of these tasks? Are they independent or are there dependencies.
  - In effect, translate the V-Cycle steps into tasks ←
- 3. What is the estimate of the amount of elapsed time that a task will take?
- 4. What resources will the task need for its completion? ↗

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## Prior to Constructing the Gantt Chart

- 5. What is the delivery date on this project?
- 6. Are there milestones to be achieved? If so, when are they and what is the content of the milestone?
- 7. What is the critical path?

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## GanttProject

- A relatively simple Gantt Charting tool
- Also includes a Resource Allocation tool
- The software will be available on MyCourses or from <https://www.ganttproject.biz>
- The version we suggest is 3.2
- Note that, although other tools to do this exist, it may be easier to use this since we have some experience with it
- You should include the .gan file each week in your documentation for the weekly meetings

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## The Gantt Chart

- Remember: *The goal in building a Gantt chart is to*
  - Perform the initial planning for managing the project
  - *Identify whether the project can be done in budget*
- To do this, the Gantt chart for the ENTIRE project must be constructed at the start of the project, i.e. by Feb 27 **at the latest**.
- Resources must be allocated to each task with estimates of the hours needed from each resource to complete the task
  - This is done in the Resources tab of the Gantt Program
  - The total cost of the project can then be estimated to determine if it is on budget
  - This number (i.e. estimated budget) should be produced by Feb 27 and updated each week

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## Building the Gantt Chart - Management

- A few rules
  - Get all team members commitments for the entire time of the project
  - Do not overload any team member in the first draft
  - Do not create a task on the timeline which runs more than 2 or 3 days – in the context of this work, this is a very long time and if a problem occurs you need to be able to identify it as soon as possible

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## Building the Gantt Chart - Management

- A Few Rules (Cont'd)
  - Clearly identify dependencies between tasks
  - Do not forget to include documentation tasks and, in particular, the tasks involved in developing the presentation of the project.
- So – let's look at the actual program

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## Time Sheets

- The work performed by each team member each week will be recorded in a time sheet.
- The sheet to be used is in Excel and will be available on MyCourses
- Each week, each member of the team should submit the number of hours worked and the ID's of the tasks worked on
  - The ID's are available from the Gantt chart and each team member can see which ID's were allocated to her/him from the Resources tab of the Gantt program.
  - The team member can also see the estimated time cost of each task and feed back information to the Project manager of cost over or under runs.

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## Time Sheets

- The time sheet will keep a running total of the hours spent by each team member
  - The actual cost of a task can be seen (allowing feedback on estimation accuracy)
  - the max “budget” per team member is 58.5 hours over the length of the project.
- Each week, the Project Manager should
  - update the Gantt chart based on the actual hours reported by each team member for each task
  - determine whether the tasks worked on were completed on time.

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## Time Sheets

- The Gantt chart should
  - show what has been spent to date
  - what a task actually cost (compared to the estimate)
  - the plan for tasks and spending going forwards..
- Copies of the Gantt chart (the .gan file) and the Time Sheet (the .xls) file MUST be available each week before the weekly design meeting

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## Summary

- We have:
  - Determined how to estimate tasks ✓
  - Described the various roles within the design team ✓
  - Looked at the key dates on the project ✓
  - Accessed GanttProject ✓
  - Discussed the tasks and dependencies ✓

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## Questions?

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