

# Advanced SolidWorks course curriculum development

04/24/2017

## Group: F

- Naser Alhajri ( Client Contact )
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- Muhammad Alhajri ( Web Designer)
- Abdualziz Alajmi (Budget Liaison)



# Project Description

- ▶ NAU has a class which is ME 180 (Engineering Graphics), which contain:
  - ▶ There is some amount of modules (3D sketches on papers).
  - ▶ Using SolidWorks as main program for the course
  - ▶ Doing parts, assembly and drawing sheet in SolidWorks.
  - ▶ Using basic features and tools, such as:
    - ▶ Extrude boss/cut
    - ▶ Revolve
    - ▶ Mirror
    - ▶ Fillet and chamfer



# Project Description

- ▶ Creating ME 380 Advanced SolidWorks
- ▶ It is the upper level course for ME 180, which contain:
  - ▶ It will have more 3D sketches on paper with advance techniques.
  - ▶ Advanced tutorials will be use for entire semester.
  - ▶ Project will have many theme ideas.
  - ▶ Apply advanced features and tools like;
    - ▶ Animation
    - ▶ Rendering
    - ▶ Equations
    - ▶ Advanced sweeping and etc.



# Design Description: Outline

## Design Description Outline:

- ▶ Syllabus
- ▶ Lectures
- ▶ Homework
- ▶ Projects
- ▶ Exams

# Design Description: Syllabus



**MECHANICAL ENGINEERING DEPARTMENT**  
**ME 380-Section—Advanced SolidWorks**  
**(3.0 credit hours)**  
**Fall 2017**

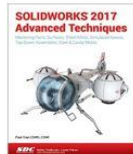
**Catalog Description**

ME 380-00#—Advanced SolidWorks (3 credits). Fundamentals of graphical communications, including sketching, computer-aided drafting, design, and parametric modeling.

**Prerequisites**

MAT 136 (Calculus), CS 122 (Computer Science) and ME 180 (Engineering Graphics) with grades greater than or equal to "C".

**Readings and Materials**



**Textbook:**  
 Paul Tran, SolidWorks 2017, CSWE, CSWI. ISBN: 978-1-630570-59-0

**Instructor**

First Last Rm 3, Phone #, email: #  
 Office hours: Day# hour#, or by appointment

**Meeting Times**

Section # -- Day# Hour# in Engineering (bldg. 69), room #.

**Course Objective**

The main objective of this course is to provide Mechanical Engineering students with an advanced techniques and ability in SolidWorks program. The student will be able to understanding the advance tutorial, sweep and loft, surfaces, sheet metal, weldment, mold tooling, top down assembly, motion study and GT&T.

**Course Student Learning Outcomes**

The main objective of this course is to provide Mechanical Engineering students with an advanced techniques and ability in SolidWorks program. The student will be able to understanding the advance tutorial, sweep and loft, surfaces, sheet metal, weldment, mold tooling, top down assembly, motion study and GT&T. Upon completion of this class, you will be able to:

1. Ability to identify, formulate, and solve engineering problems
2. Ability to design and conduct experiments, as well as to analyze and interpret data
3. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
4. Use the solid modeling capabilities of a computer-aided design (CAD) package to generate three-dimensional solid model.
5. Have a thorough understanding and be able to create engineering drawings
6. Sketch free-hand pictorials of three-dimensional objects.
7. Read engineering scales and take driving dimensions from manufactured parts.

\* LO's refer to ME Learning Outcomes, as listed in a separate

<https://nau.edu/CEFS/Engineering/Mechanical/Objectives-and-Outcomes/>

**Learning Outcomes**

your understanding and knowledge of the course objectives. Exams will allow the instructor to assess your level of knowledge of the course objectives as well as serving as additional learning opportunities.

**Grading**

Your final grade will be based upon the monthly exams, homework problems, and final exam as follows:

RELATIVE WEIGHT		GRADE DISTRIBUTION	
Class Participation/Attendance	5%	A	90%+
Exam #1	10%	B	80 to 89%
Exam #2	10%	C	70 to 79%
Homework	25%	D	60 to 69%
Quizzes	15%	F	Below 60%
Final Exam	10%		
Project	20%		
<b>Total</b>	<b>100%</b>		

**Homework:**

Homework will be assigned on Blackboard, and is considered due before the relevant quiz or test for that chapter. There will be eleven homework for the course, seven of them will be in SolidWorks and three will be in 3D Sketch on paper.

**Quizzes:**

There will be seven in-class quizzes. Each quiz will consist of one or two problems, which are based on recently assigned homework and in-class assignments.

**Exams:**

It is typical that your examination work will be immaculate, clear, and all together. In case it is not, you may not get midway credit for your work. There will be three exams for this course and each exam is worth 10% of your grade. Each exam will consist of problems designed to comprehensively test your knowledge of the material.

**Project:**

Students will create a 3D assembly consisting of several 3D parts. On the last day of the semester, students are required to present the project to the instructor and save the project in its entirety to the school directory for inspection. The project will be integrated into course work over the semester and based on the theme that the instructor assigned. It is expected that each student completes his or her own work, otherwise grade reduction will result.

**ME 380-00#—Advanced SolidWorks**  
**Fall 2017 Tentative Schedule**

Week	Topic	Chapter Reading	Assigned	Due date
1	Introduction to 3D sketch	Ch 1	HW1-Modeling 3D	
2	Advanced Modeling	Ch 3	HW2-SD 1 Quiz 1	Due HW 1
3	Sweep with composite curves	Ch 4	HW3-SD 2	Due HW 2
4	Advanced Modeling with sweep & loft	Ch 5	HW4-SD 3 Quiz 2	Due HW 3
5	Exam 1	Ch 1,3,4,5		DUE HW 4
6	Loft with guide curves	Ch 7	Project 1, HW 5-Modeling 3D	
7	Using Surfaces-Advanced modeling	Ch 8	HW 6-SD4 Quiz 3	Due HW 5
8	Advanced surface-offset surface & RULED SURFACE	Ch 9	HW 7-SD 5	Due HW 6
9	Surfaces vs Solid Modeling	Ch 11	HW 8-SD 6 Quiz 4	Due HW 7
10	Sheet metal parts	Ch 13	Quiz 5	Due project 1
11	Exam 2	Ch 7,8,9,11	Project 2	Due HW 8
12	<b>Start on Project 2 outside class / Thanksgiving break</b>			
13	Sheet metal conversions	Ch 15	HW 9- modeling 3D Quiz 6	
14	Creating a core and cavity-Linear parting lines	Ch 17	HW 10-SD 7 Quiz 7	Due HW 9
15	Top-Down assembly	Ch 19	HW 11- SD 8	Due HW 10
16	<b>FINAL EXAM - DECEMBER # - Day - Time</b>			Due HW 11, Project 2

Figure 1: Syllabus

# Design Description: lectures

- ▶ The class will start with Pre lecture quiz on Top Hat.
- ▶ Lecture structure and how the lecture will flow.
- ▶ Practicing class work after the lecture.
- ▶ The lecture will be recorded and posted in Black Board.

Table 1: Lecture Topics

Topic
Introduction to 3D sketch
Advanced Modeling
Sweep with composite curves
Advanced Modeling with sweep & loft
Loft with guide curves
Using Surfaces-Advanced modeling
Advanced surface-offset surface & RULED SURFACE
Surfaces vs Solid Modeling
Sheet metal parts
Sheet metal conversions
Creating a core and cavity-Linear parting lines
Top-Down assembly

# Design Description: Homework

## Problem 1( 100 marks):

Use grid paper to draw a multi-view drawing of the shape shown below following all drawing conventions.

- 1- You must correctly draw the 3 primary views in the proper orientation to each other third angle projection. Front, right and left view should be well arranged. (10 marks)
- 2- Scale the object such that it substantially fills your sheet of grid paper ( two or three page, three drawing). The scale below is 1 grid=0.25 in. ( 60 marks)
- 3- You must show hidden lines, centerlines and center marks if necessary for all your views.(15 marks)
- 4- Label all appropriate views, dimensions, names, and scale with uppercase gothic. (15 marks)

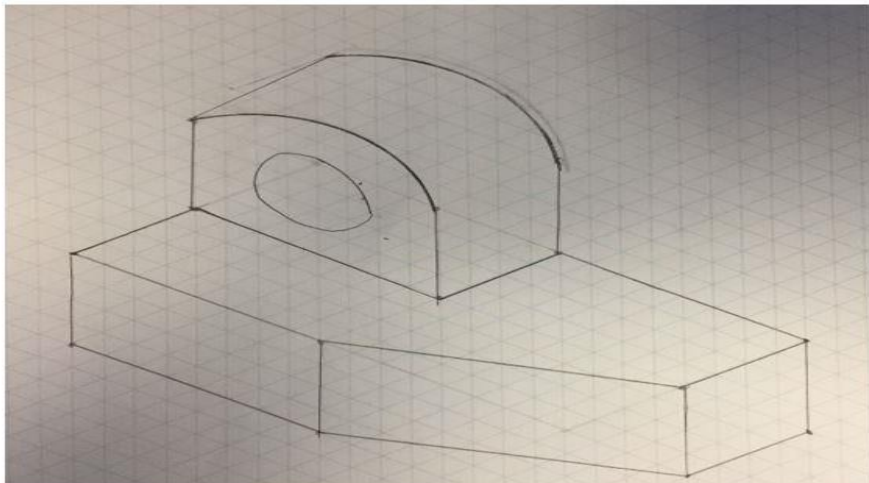


Figure 2: 3D Sketches Homework

## Homework 9

(100 marks) Create the model with view is shown in figure 1. You will use Sheet Metal Features for this Homework. The other views and dimensions of the model are also given in the other figure. In order to complete this model, the tools needed are:

- 1- Line
- 2- Circle (0.25 in)
- 3- Base Flange ( 4.00in, 16 Gauge)
- 4- Edge Flange ( 90°, 5.00in)
- 5- Sketch Bend ( 90°)
- 6- Flat Pattern

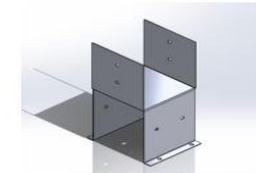


Figure 1

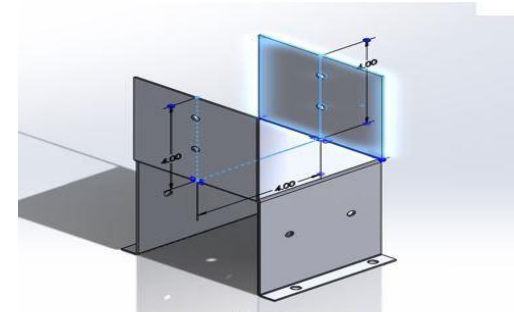


Figure 1-2

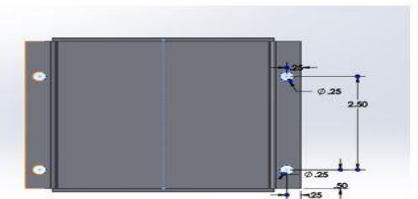


Figure 1-3

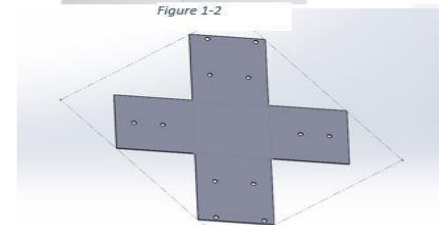


Figure 1-4

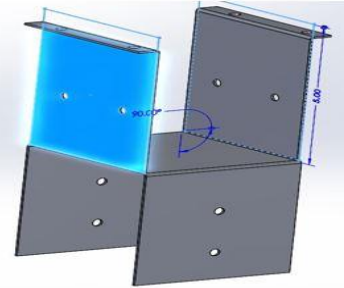


Figure 1-5

Figure 3: SolidWorks Homework

# Design Description: Project

- ▶ We will have two projects in the ME380 course
- ▶ the projects are:
  - ▶ The first one will be chosen by the instructor
  - ▶ The second one will be chosen by the student and it has to be real life example
- ▶ The Example from second Project (slide):
  - ▶ Weldment
  - ▶ Sheet metal (swept flange, edge flange)
  - ▶ Hem

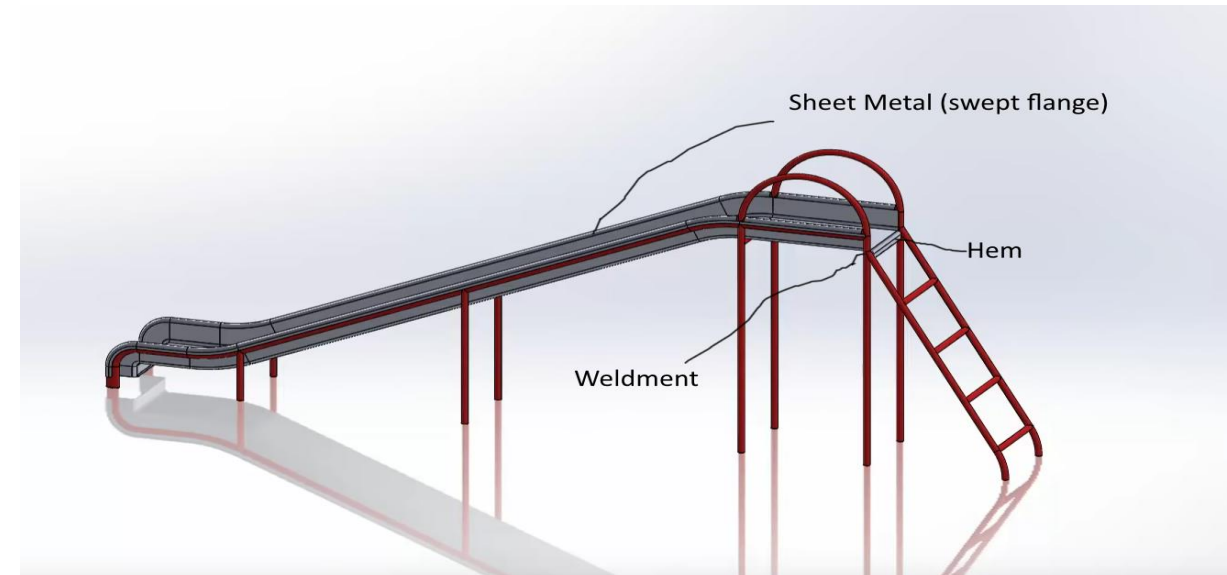


Figure 4: Slide Project



# Design Description: Exam

▶ Advanced techniques tools used in this example of an exam:

- ▶ Extrude Bore and Cut
- ▶ Revolve and Revolve Cut
- ▶ Circular Pattern
- ▶ Fillet and Chamfer
- ▶ Hole Wizard
- ▶ Loft
- ▶ Animation



Figure 5: Wind Turbine

ME 380 (Advanced SolidWorks)  
Exam #

Fall 2017

First:

Last:

/100

Include your first and last name in the parts file properties.

- 1) Model the following parts in SolidWorks with the given dimensions:
  - a. Base in figure 1 /10
  - b. Rotor in figure 2 /10
  - c. Blade in figure 3 /5
  - d. Lower Nut in figure 4 /5
  - e. Upper Nut in figure 5 /5
  - f. Shaft in figure 6 /10
  - g. Washer in figure 7 /5
  - h. Housing in figure 8 /10
- 2) Using SolidWorks, assemble the parts into Wind Turbine as shown in figure 9. /15
- 3) Use the animation tool to test the Wind Turbine work with 30-rpm speed. /15
- 4) Draw the assembly in the drawing sheet showing the dimension. /10

Figure 6: example of an exam

# Design Requirements: HoQ

Table 2: House of Quality

House of Quality (HoQ)											
Customer Requirement	Weight	Engineering Requirement	at least 5 assignment based on 3D drawing	at least 9 assignments based on advanced feauters in Solid Work	at least 3 exams	at least 9 quizzes	at least 6 lecturs in the semester	at least 6 labs in the semester	at least 6 different themes	at least 2 extra cridet homework	at least 3 outside class toutrials
1. ability to identify, formulate, and solve engineering problems	4		1	9	6	6	9	9	9	3	6
2. ability to design and conduct experiments, as well as to analyze and interpret data	4		1	9	6	3	6	6	6	3	6
3. ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	5		6	6	9	3	9	6	9	6	3
4. Use the solid modeling capabilities of a computer-aided design (CAD) package to generate three-dimensional solid model.	3		1	9	9	1	6	9	9	1	3
5. Have a thorough understanding and be able to create engineering drawings	3		9	3	6	3	6	6	6	3	6
6. Sketch free-hand pictorials of three-dimensional objects.	4		9	1	6	6	6	6	6	3	6
7. Read engineering scales and take driving dimensions from manufactured parts.	3		6	6	3	9	6	9	6	1	3
<b>Absolute Technical Importance (ATI)</b>			122	160	171	114	183	186	192	81	123
<b>Relative Technical Importance (RTI)</b>			7	5	4	8	3	2	1	9	6
<b>Target(s)</b>			7	10	4	12	8	8	6	4	5
Tolerance(s)			-/+ 3'	-/+ 2'	-/+ 1'	-/+ 4'	-/+ 2'	-/+ 2'	-/+ 3'	-/+ 2'	-/+ 2'

# Design Requirements: Customer Requirements

- ▶ Apply equations in SolidWorks and solving them.
- ▶ Students will be able to design models in their projects, homework and etc.
- ▶ They will apply the advanced techniques in the course.
- ▶ Using real life examples and model it in CAD package.
- ▶ Know how to be professional in drawing sheet.
- ▶ Be expert in 3D sketches in the course.
- ▶ Know how to measure dimension for real part and apply it in SolidWorks.

Table 3: Customer Requirements

<b>Customer Requirement</b>
1. ability to identify, formulate, and solve engineering problems
2. ability to design and conduct experiments, as well as to analyze and interpret data
3. ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
4. Use the solid modeling capabilities of a computer-aided design (CAD) package to generate three-dimensional solid model.
5. Have a thorough understanding and be able to create engineering drawings
6. Sketch free-hand pictorials of three-dimensional objects.
7. Read engineering scales and take driving dimensions from manufactured parts.

# Budget

## ► Cost:

- Our project will depend on the stuff that we need for the new c can propose it to the client.
- For example:
  - Basic Engineering Drafting Kit/ cost (\$48.92).
  - 3D printer/ cost(depends on weight).
  - Lego for themes/cost (\$9.99).
  - SolidWorks 2017 Advanced Techniques on PDF (\$62.20).



[1]



[2]

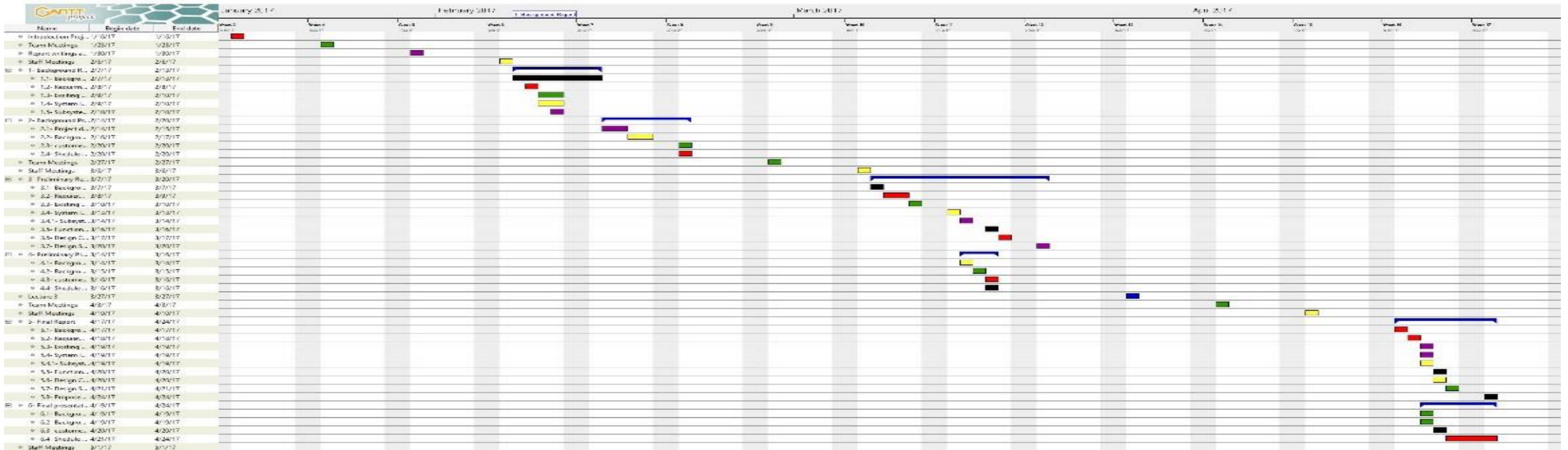


[4]



[3]

# Gantt chart & Scheduling: entire course



M. Alhajri Y. Alhaddad A. Alajmi N. Alhajri M. Alfadhli Team

Figure 7: Gantt Chart for entire course

# Gantt chart & Scheduling: zoom in for final proposal

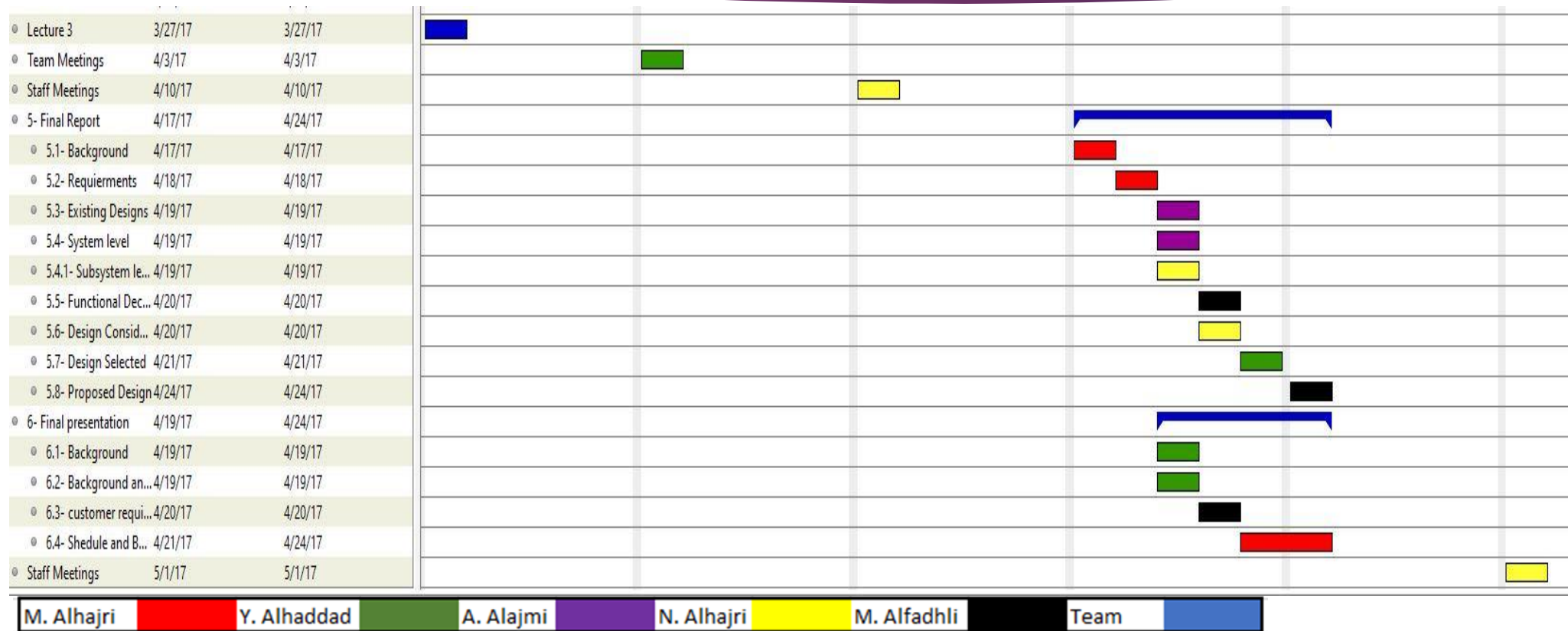


Figure 8: Gantt Chart zoom in for final proposal

# References

- ▶ [1] <https://shop.lego.com/en-US/Super-Soarer-31042>
- ▶ [2] <http://www.draftingsteals.com/20467.html?gclid=ClyRxOWTm9ICFYqBfgodvh4LMQ>
- ▶ [3] <http://uk.pcmag.com/printer-reviews/36506/guide/the-best-3d-printers-of-2017>
- ▶ [4] <https://www.amazon.com/SOLIDWORKS-2017-Advanced-Techniques-Paul/dp/1630570591>

ASK ME  
ANYTHING

إسألني أي شيء ... !