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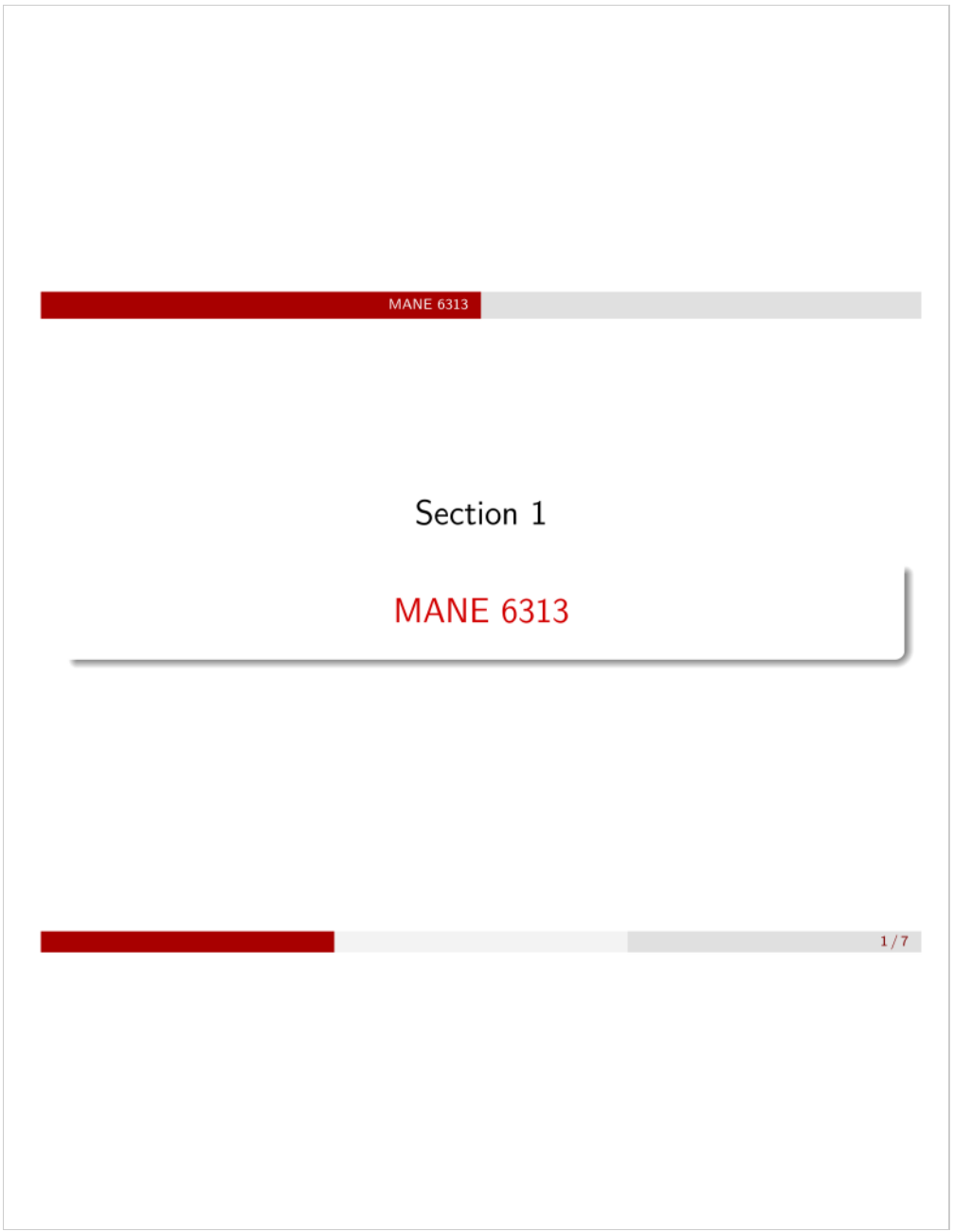


Subsection 1

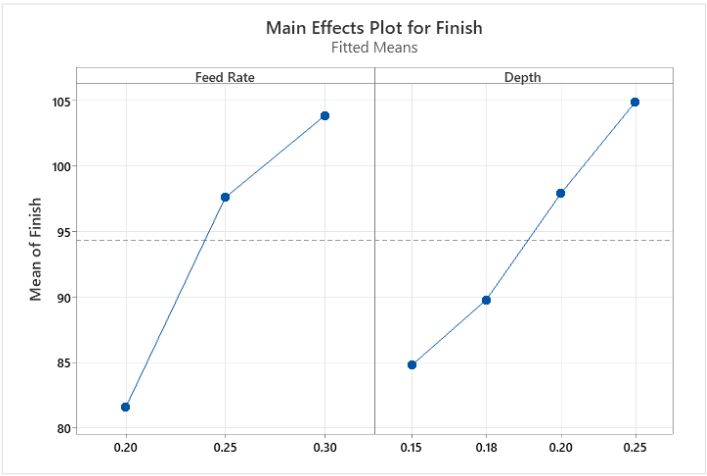
Week 6, Module C

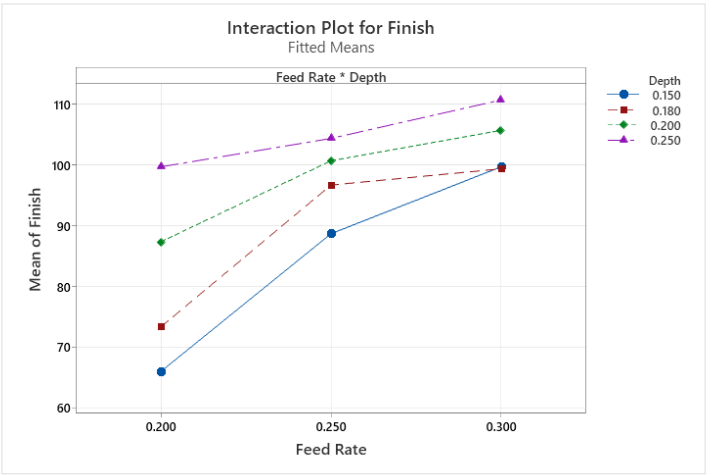
Student Learning Outcome

- Select an appropriate experimental design with one or more factors,
- Select an appropriate model with one or more factors,
- Evaluate statistical analyses of experimental designs,
- Assess the model adequacy of any experimental design, and
- Interpret model results.

Module Learning Outcome

Interpreting interactions in factorial designs.





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SS Calculation for Interaction

Consider two factors A and B

1. Step 1. Calculate sum of squares between the ab cell totals (subtotals)

$$SS_{\text{Subtotals}} = \frac{1}{n}\sum_{i=1}^{a}\sum_{j=1}^{b} y_{ij\cdot}^2 - \frac{y_{\cdots}^2}{abn}$$

2. Step 2. Calculate SS_A and SS_B
3. Step 3. $SS_{AB} = SS_{\text{Subtotals}} - SS_A - SS_B$

Rules for Interpreting Interactions

Limited to models with two-factor interactions and main effects

1. If an interaction is statistically significant for a two-factor interaction, use the interaction plot to select the optimal setting
2. If the interaction is not statistically significant for a two-factor interaction, use the main effect plot to select the optimal setting
3. For more sophisticated designs, use the Response Optimizer

Minitab Analysis of Interactions

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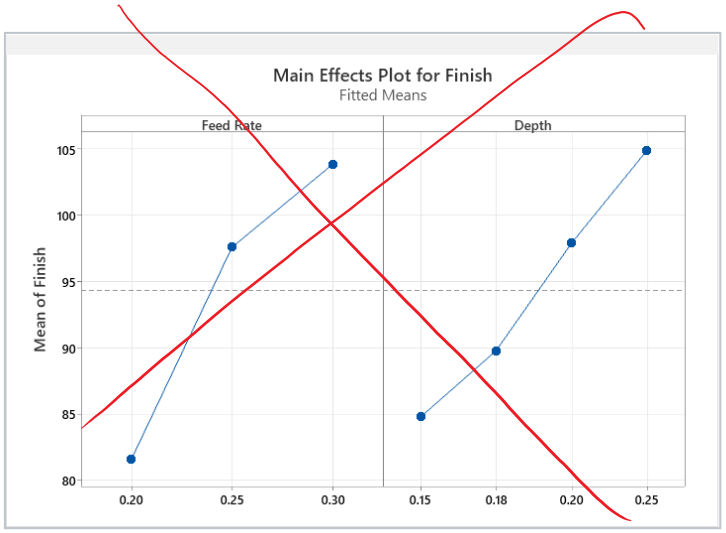
Finish -> roughness (minimize)



feed rate = .2, Depth = .15

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Response Optimization: Finish

Parameters

Response	Goal	Lower	Target	Upper	Weight	Importance
Finish	Minimum		60	114	1	1

Solution

Solution	Feed Rate	Depth	Finish Fit	Composite Desirability
1	0.2	0.15	66	0.888889

Multiple Response Prediction

Variable	Setting
Feed Rate	0.2
Depth	0.15

Response	Fit	SE Fit	95% CI	95% PI
Finish	66.00	3.09	(59.61, 72.39)	(53.23, 78.77)

confidence interval

prediction interval

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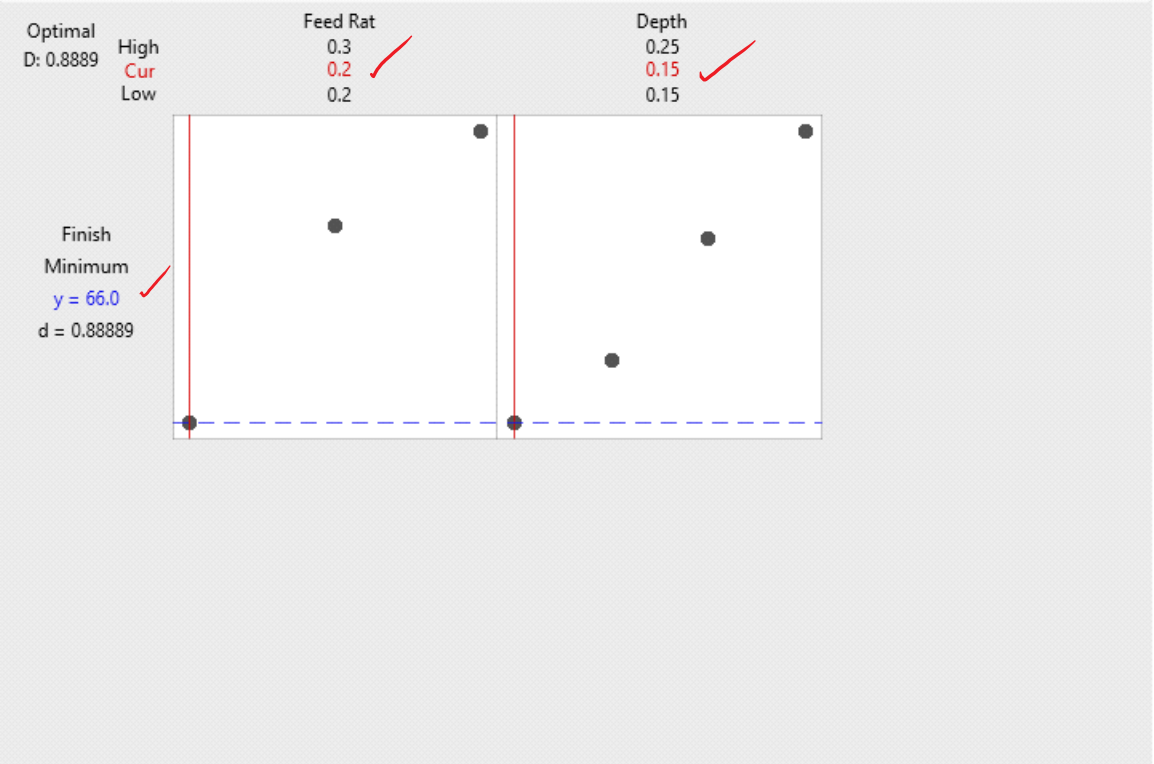
Response Optimization: Finish

Finish	66.00	3.09	(59.61, 72.39)	(53.23, 78.77)



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