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# Lab 02

# Introduction to lathe Machine perform straight turning and calculate machining time.

# Plots

Required for lab 02 plots graphs

Plot a relationship between RPMs and Cutting speed.

Plot a relationship between RPMs and Feed.

Plot a relationship between RPMs and Machining time.

Plot a relationship between RPMs and Actual time.

Plot a relationship between machining time and actual time.

# MATLAB Code

% Lab 02: Introduction to Lathe Machine

% Student: (Barira Qasim - F2022031016)

% Given Data

L = [52, 50, 49, 48, 45]; % Length of rod in mm

Di = [25.00, 43.10, 29.20, 36.90, 35.60]; % Initial Diameter in mm

Df = [24.00, 25.50, 23.20, 24.15, 25.50]; % Final Diameter in mm

N\_t = 1; % Number of passes

RPM = 660; % RPM constant for all operations

% Depth of Cut Calculation

depth\_of\_cut = (Di - Df) / (2 \* N\_t); % Depth of cut in mm

% Cutting Speed Calculation

cutting\_speed = pi .\* Di \* RPM; % Cutting speed Vi in mm/min

% Feed Rate Calculation

Fr = 60.03; % Feed rate in mm/min

feed\_rate = Fr / RPM; % Feed in mm/rev

% Machining Time Calculation

Tm = (L ./ (feed\_rate \* RPM)) \* N\_t; % Machining Time in minutes

% Actual Times from Data

Ta\_sec = [22.20, 124.80, 26.40, 49.20, 58.80]; % Actual times in seconds

Ta = Ta\_sec / 60; % Convert to minutes

% Plotting Relationships

% 1. Plot: RPMs vs Cutting Speed

figure;

plot(RPM \* ones(size(Di)), cutting\_speed, '-o', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Cutting Speed (mm/min)');

title('Lab 02: RPMs vs Cutting Speed (Barira Qasim - F2022031016)');

legend('Cutting Speed vs RPMs');

grid on;

% 2. Plot: RPMs vs Feed Rate

figure;

plot(RPM \* ones(size(Di)), feed\_rate, '-s', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Feed Rate (mm/rev)');

title('Lab 02: RPMs vs Feed Rate (Barira Qasim - F2022031016)');

legend('Feed Rate vs RPMs');

grid on;

% 3. Plot: RPMs vs Machining Time

figure;

plot(RPM \* ones(size(Di)), Tm, '-d', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Machining Time (min)');

title('Lab 02: RPMs vs Machining Time (Barira Qasim - F2022031016)');

legend('Machining Time vs RPMs');

grid on;

% 4. Plot: RPMs vs Actual Time

figure;

plot(RPM \* ones(size(Di)), Ta, '-\*', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Actual Time (min)');

title('Lab 02: RPMs vs Actual Time (Barira Qasim - F2022031016)');

legend('Actual Time vs RPMs');

grid on;

% 5. Plot: Machining Time vs Actual Time

figure;

plot(Tm, Ta, '-x', 'LineWidth', 2);

xlabel('Machining Time (min)');

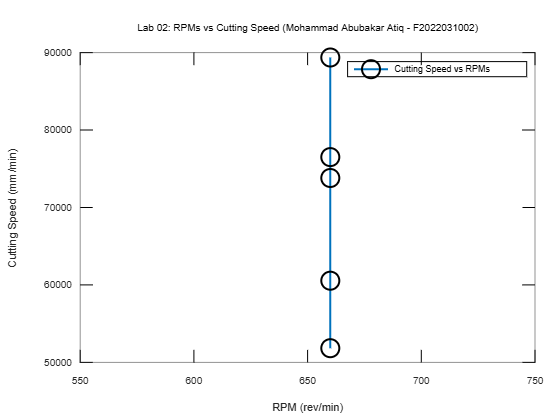
ylabel('Actual Time (min)');

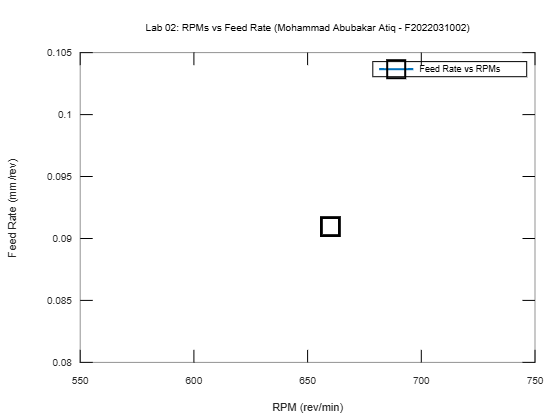
title('Lab 02: Machining Time vs Actual Time (Barira Qasim - F2022031016)');

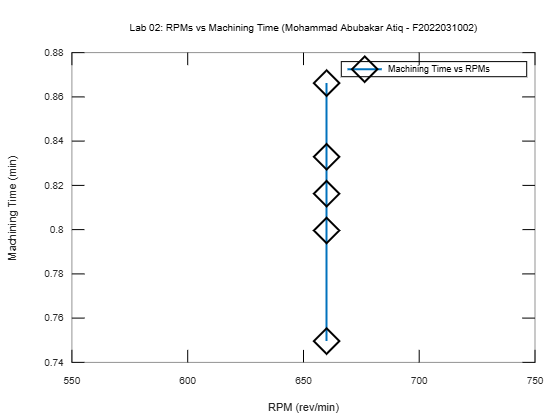
legend('Actual Time vs Machining Time');

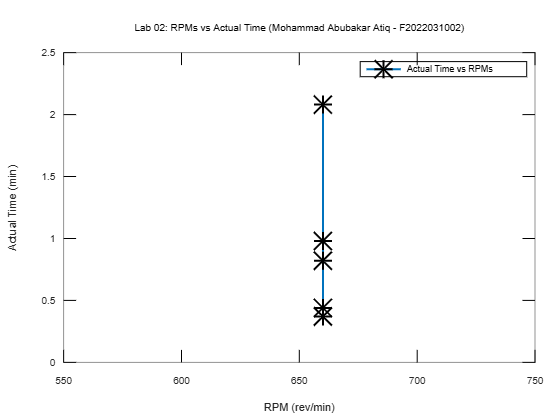
grid on;

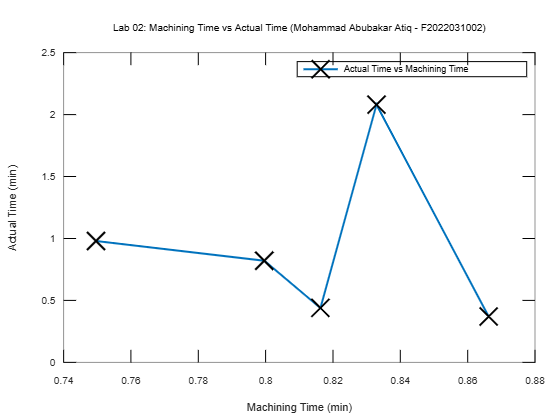
# Graph











# Comments

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# Lab 04

# Perform facing operation on MS rod to calculate machining time and material removal rate (MRR).

# Plots

Plot a relationship between RPMs and cutting speed.

Plot a relationship between RPMs and feed.

Plot a relationship between RPMs and machining time.

Plot a relationship between RPMs and actual machining time.

Pot a relationship between machining time and actual machining time.

Plot a relationship between RPMs and material removal rate.

# MATLAB Code

% Lab 04: Facing Operation on MS Rod

% Student: (Barira Qasim - F2022031016)

% Given Data

RPM = [660, 660, 660, 660, 660, 660, 660, 660, 660]; % RPM constant for all

Cutting\_Speed = [78376.45, 76303.00, 74229.55, 72156.10, ...

53080.35, 60544.77, 76510.35, 94549.37, ...

87706.98]; % Cutting speeds in mm/min

Feed = [0.018, 0.018, 0.018, 0.018, ...

0.018, 0.018, 0.018, 0.018, ...

0.018]; % Feed per revolution in mm/rev (constant for all)

Machining\_Time = [1.10, 1.90, 1.50, 2.20, ...

2.28, 0.40, 0.81, 0.95, ...

0.89]; % Machining time in minutes

Actual\_Time = [66.00/60, 114.00/60, 90.00/60, ...

132.00/60, 136.80/60, ...

24/60, 48.60/60, ...

57/60, 53.40/60]; % Actual time in minutes (converted from seconds)

Depth\_of\_Cut = [1, 1, 1, 1, ...

1, 2, 1, ...

1, 1]; % Depth of cut in mm (constant for all)

% Plotting Relationships

% Plot: RPMs vs Cutting Speed

figure;

plot(RPM, Cutting\_Speed', '-o', 'LineWidth',2);

xlabel('RPM (rev/min)');

ylabel('Cutting Speed (mm/min)');

title('Lab04: RPM vs Cutting Speed (Barira Qasim - F2022031016)');

legend('Cutting Speed vs RPM');

grid on;

% Plot: RPMs vs Feed

figure;

plot(RPM, Feed', '-s', 'LineWidth',2);

xlabel('RPM (rev/min)');

ylabel('Feed (mm/rev)');

title('Lab04: RPM vs Feed (Barira Qasim - F2022031016)');

legend('Feed vs RPM');

grid on;

% Plot: RPMs vs Machining Time

figure;

plot(RPM, Machining\_Time', '-d', 'LineWidth',2);

xlabel('RPM (rev/min)');

ylabel('Machining Time (minutes)');

title('Lab04: RPM vs Machining Time (Barira Qasim - F2022031016)');

legend('Machining Time vs RPM');

grid on;

% Plot: RPMs vs Actual Time

figure;

plot(RPM, Actual\_Time', '-x', 'LineWidth',2);

xlabel('RPM (rev/min)');

ylabel('Actual Time (minutes)');

title('Lab04: RPM vs Actual Time (Barira Qasim - F2022031016)');

legend('Actual Time vs RPM');

grid on;

% Plot: Machining Time vs Actual Time

figure;

plot(Machining\_Time', Actual\_Time', '-\*', 'LineWidth',2);

xlabel('Machining Time (minutes)');

ylabel('Actual Time (minutes)');

title('Lab04: Machining Time vs Actual Time (Barira Qasim - F2022031016)');

legend('Actual Time vs Machining Time');

grid on;

% Calculate Material Removal Rate (MRR)

MRR = pi .\* Depth\_of\_Cut .\* Feed .\* Cutting\_Speed; % MRR in mm^3/min

% Plot: RPMs vs Material Removal Rate

figure;

plot(RPM', MRR', '-^', 'LineWidth',2);

xlabel('RPM (rev/min)');

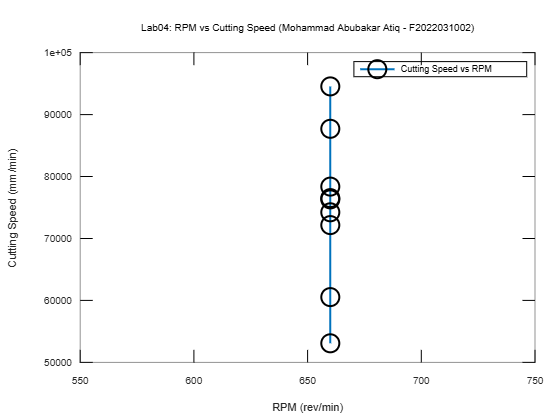
ylabel('Material Removal Rate (mm^3/min)');

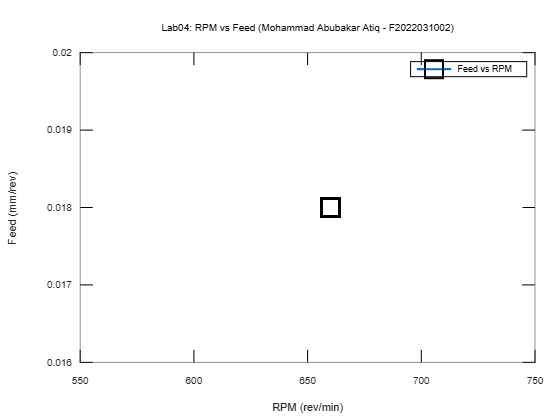
title('Lab04: RPM vs Material Removal Rate (Barira Qasim - F2022031016)');

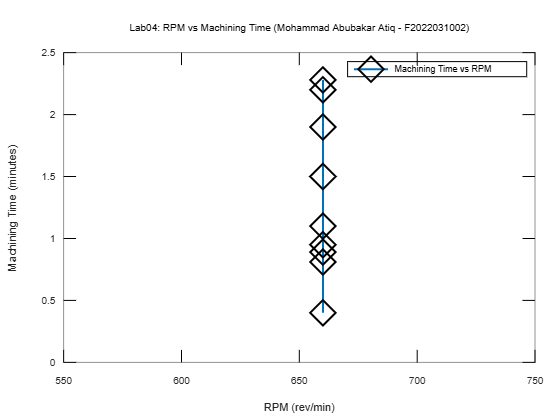
legend('Material Removal Rate vs RPM');

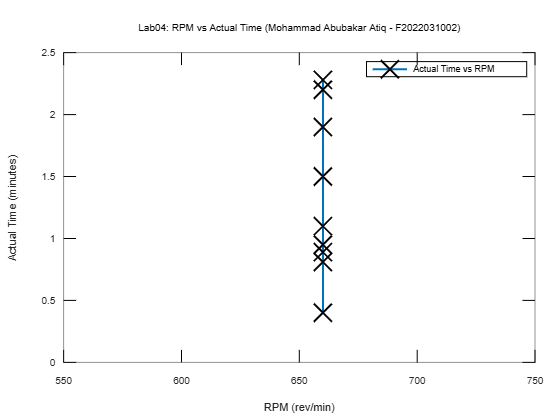
grid on;

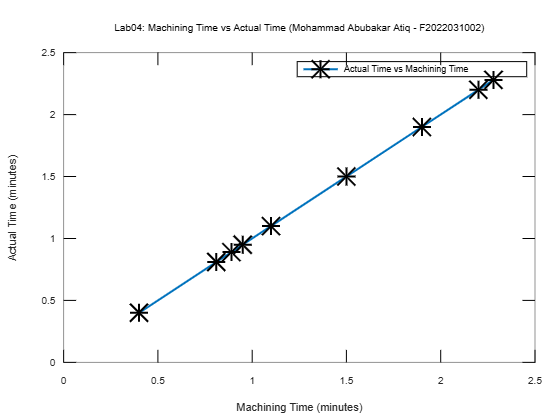
# Graphs

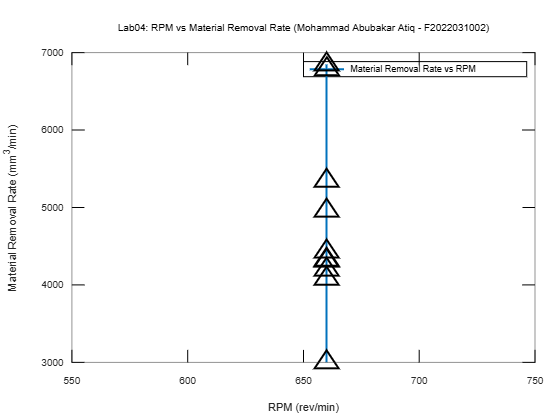












# Comments:

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# Lab 07

# **Perform facing operation on shape machine to calculate machining time.**

# Plots

Plot a relationship between feed and cutting speed.

Plot a relationship between cutting speed and theoretical machining time.

Plot a relationship between cutting speed and actual machining time.

Plot a relationship between actual and theoretical machining time.

# MATLAB CODE:

% Lab 07: Facing Operation on Shaper Machine

% Student: (Barira Qasim - F2022031016)

% Given Data

Length\_of\_Workpiece = [86, 123.45, 123.25, 123.35, 123.15, 123.05]; % mm

Width\_of\_Workpiece = [30, 26.4, 25.7, 26.25, 26.2, 26.1]; % mm

Clearance\_Length = [142, 179.45, 179.25, 179.35, 179.15, 179.05]; % mm

No\_of\_Stroke\_per\_min = [60, 60, 60, 60, 60, 60]; % strokes/min

Feed = [0.3, 0.3, 0.3, 0.3, 0.3, 0.3]; % mm/stroke

Cutting\_Speed = [14200, 17945, 17925, 17935, 17915, 17905]; % mm/min

Thickness\_initial = [21.3, 20.0, 19.3, 18.25, 18.2, 18.1]; % mm

Depth\_of\_Cut = [0.5, 0.5, 0.5, 0.5, 0.5, 0.5]; % mm (set)

Thickness\_final = [20.8;19.5;18.8;17.75;17.7;17.6]; % mm

Number\_of\_Passes = ones(size(Length\_of\_Workpiece)); % Number of passes set to 1

% Theoretical Machining Time Calculation (in minutes)

Theoretical\_Machining\_Time = Length\_of\_Workpiece ./ (Feed .\* No\_of\_Stroke\_per\_min);

% Actual Machining Time (provided in seconds)

Actual\_Machining\_Time\_sec = [140;160;155;175;171;174]; % seconds

Actual\_Machining\_Time = Actual\_Machining\_Time\_sec / 60; % Convert to minutes

% Percentage Difference Calculation

Percentage\_Difference = ((Actual\_Machining\_Time - Theoretical\_Machining\_Time) ./ Theoretical\_Machining\_Time) \* 100;

% Plotting Relationships

% Plot: Feed vs Cutting Speed

figure;

plot(Feed', Cutting\_Speed', '-o', 'LineWidth',2);

xlabel('Feed (mm/stroke)');

ylabel('Cutting Speed (mm/min)');

title('Lab07: Feed vs Cutting Speed (Barira Qasim - F2022031016)');

legend('Cutting Speed vs Feed');

grid on;

% Plot: Cutting Speed vs Theoretical Machining Time

figure;

plot(Cutting\_Speed', Theoretical\_Machining\_Time', '-s', 'LineWidth',2);

xlabel('Cutting Speed (mm/min)');

ylabel('Theoretical Machining Time (min)');

title('Lab07: Cutting Speed vs Theoretical Machining Time (Barira Qasim - F2022031016)');

legend('Theoretical Machining Time vs Cutting Speed');

grid on;

% Plot: Cutting Speed vs Actual Machining Time

figure;

plot(Cutting\_Speed', Actual\_Machining\_Time', '-d', 'LineWidth',2);

xlabel('Cutting Speed (mm/min)');

ylabel('Actual Machining Time (min)');

title('Lab07: Cutting Speed vs Actual Machining Time (Barira Qasim - F2022031016)');

legend('Actual Machining Time vs Cutting Speed');

grid on;

% Plot: Actual vs Theoretical Machining Time

figure;

plot(Theoretical\_Machining\_Time', Actual\_Machining\_Time', '-x', 'LineWidth',2);

xlabel('Theoretical Machining Time (min)');

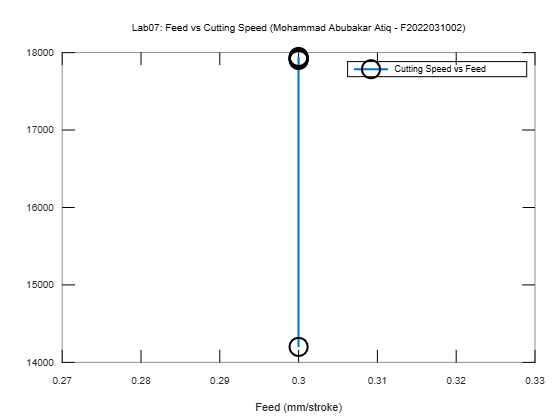
ylabel('Actual Machining Time (min)');

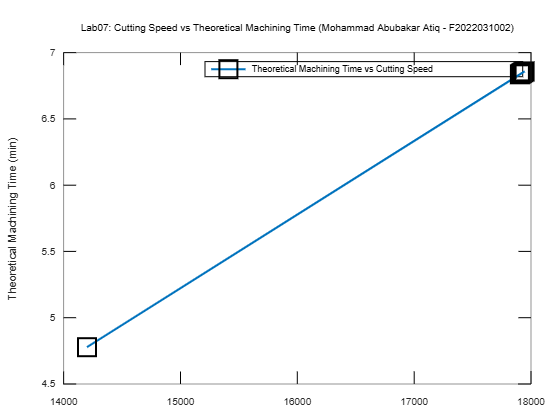
title('Lab07: Actual vs Theoretical Machining Time (Barira Qasim - F2022031016)');

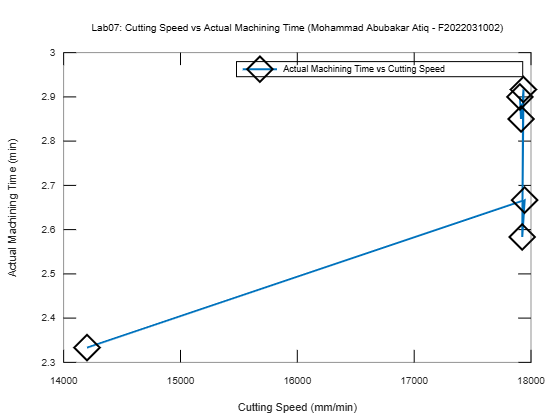
legend('Actual Time vs Theoretical Time');

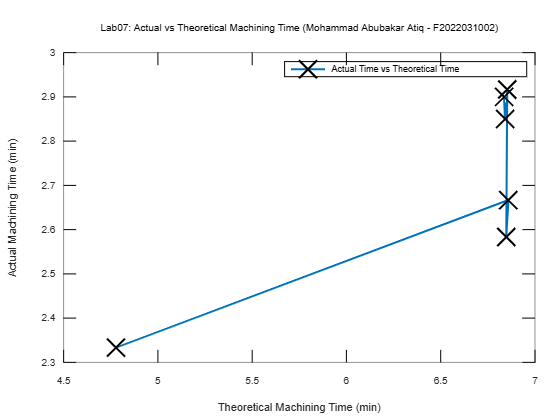
grid on;

# GRAPHS:









# Comments:

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# Lab 09

# **Introduction to milling machine and perform face milling to calculate machining time.**

# Plot

Plot a relationship between RPM and cutting speed.

Plot a relationship between RPM and feed rate.

Plot a relationship between cutting speed and feed rate.

Plot a relationship between actual and theoretical machining time.

Plot a relationship between theoretical machining time and feed rate.

Plot a relationship between actual machining time and feed rate.

# MATLAB CODE:

% Lab 09: Introduction to Milling Machine

% Student: (Barira Qasim - F2022031016)

% Given Data

L = 95; % Length of workpiece in mm

w = 50; % Width of workpiece in mm

D = 8; % Diameter of tool in mm

n\_t = 4; % Number of teeth

LC = 4; % Approach and Overtravel length in mm

feed\_per\_tooth = 8; % Feed per tooth in mm/rev

RPM = [450, 450, 450]; % RPM values for each case

% Calculating Cutting Speed and Feed Rate

cutting\_speed = pi \* D \* RPM; % Cutting Speed Vc in mm/min

feed\_rate = feed\_per\_tooth \* n\_t .\* RPM; % Feed rate fr in mm/min

% Theoretical Machining Time Calculation

T\_theoretical = (L + LC) ./ feed\_rate; % Theoretical Machining Time in min

% Actual Machining Times (converted from seconds to minutes)

T\_actual\_sec = [39, 22, 29]; % Actual machining times in seconds

T\_actual = T\_actual\_sec / 60; % Convert to minutes

% Plotting Relationships

% 1. Plot: RPM vs Cutting Speed

figure;

plot(RPM, cutting\_speed, '-o', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Cutting Speed (mm/min)');

title('Lab 09: RPM vs Cutting Speed (Barira Qasim - F2022031016)');

legend('Cutting Speed vs RPM');

grid on;

% 2. Plot: RPM vs Feed Rate

figure;

plot(RPM, feed\_rate, '-s', 'LineWidth', 2);

xlabel('RPM (rev/min)');

ylabel('Feed Rate (mm/min)');

title('Lab 09: RPM vs Feed Rate (Barira Qasim - F2022031016)');

legend('Feed Rate vs RPM');

grid on;

% 3. Plot: Cutting Speed vs Feed Rate

figure;

plot(cutting\_speed, feed\_rate, '-d', 'LineWidth', 2);

xlabel('Cutting Speed (mm/min)');

ylabel('Feed Rate (mm/min)');

title('Lab 09: Cutting Speed vs Feed Rate (Barira Qasim - F2022031016)');

legend('Feed Rate vs Cutting Speed');

grid on;

% 4. Plot: Actual vs Theoretical Machining Time

figure;

plot(T\_theoretical, T\_actual, '-\*', 'LineWidth', 2);

xlabel('Theoretical Machining Time (min)');

ylabel('Actual Machining Time (min)');

title('Lab 09: Actual vs Theoretical Machining Time (Barira Qasim - F2022031016)');

legend('Actual Time vs Theoretical Time');

grid on;

% 5. Plot: Theoretical Machining Time vs Feed Rate

figure;

plot(feed\_rate, T\_theoretical, '-^', 'LineWidth', 2);

xlabel('Feed Rate (mm/min)');

ylabel('Theoretical Machining Time (min)');

title('Lab 09: Feed Rate vs Theoretical Machining Time (Barira Qasim - F2022031016)');

legend('Theoretical Time vs Feed Rate');

grid on;

% 6. Plot: Actual Machining Time vs Feed Rate

figure;

plot(feed\_rate, T\_actual, '-x', 'LineWidth', 2);

xlabel('Feed Rate (mm/min)');

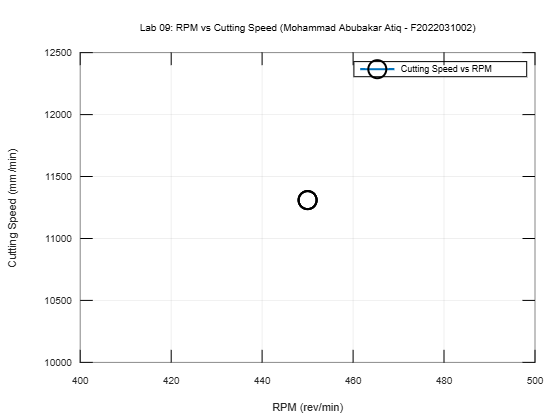
ylabel('Actual Machining Time (min)');

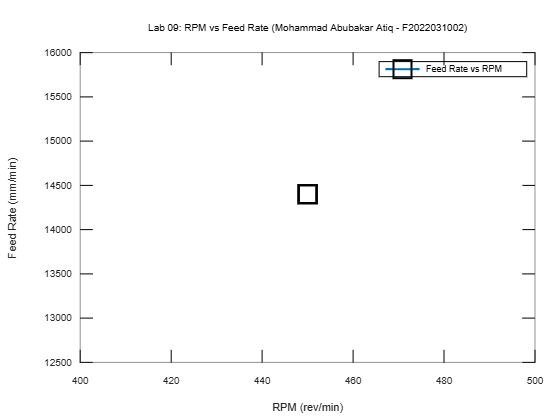
title('Lab 09: Feed Rate vs Actual Machining Time (Barira Qasim - F2022031016)');

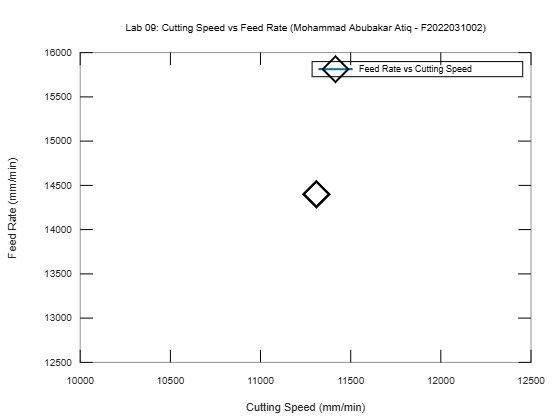
legend('Actual Time vs Feed Rate');

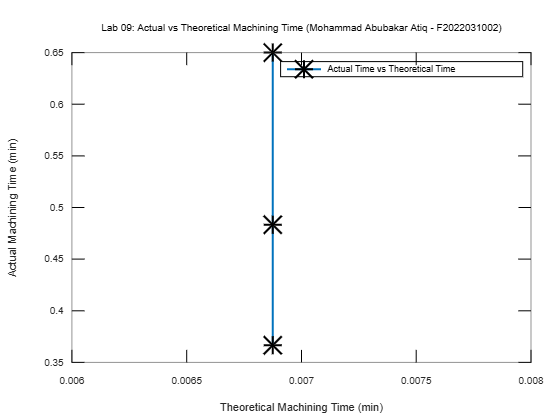
grid on;

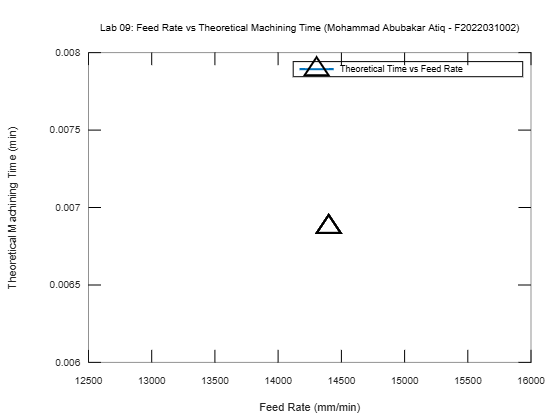
# Graphs:

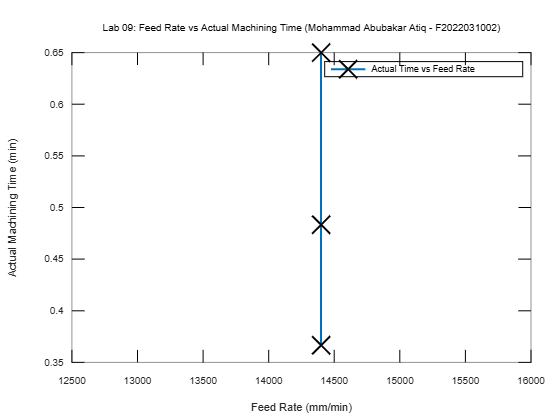












# Comments:

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