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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: Mohammad Abubakar Atiq (F2022031002)
```

```
% 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 (Mohammad Abubakar Atiq - F2022031002)');

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 (Mohammad Abubakar Atiq - F2022031002)');

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 (Mohammad Abubakar Atiq - F2022031002)');
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 (Mohammad Abubakar Atiq - F2022031002)');
legend('Actual Time vs RPMs');
grid on;

```

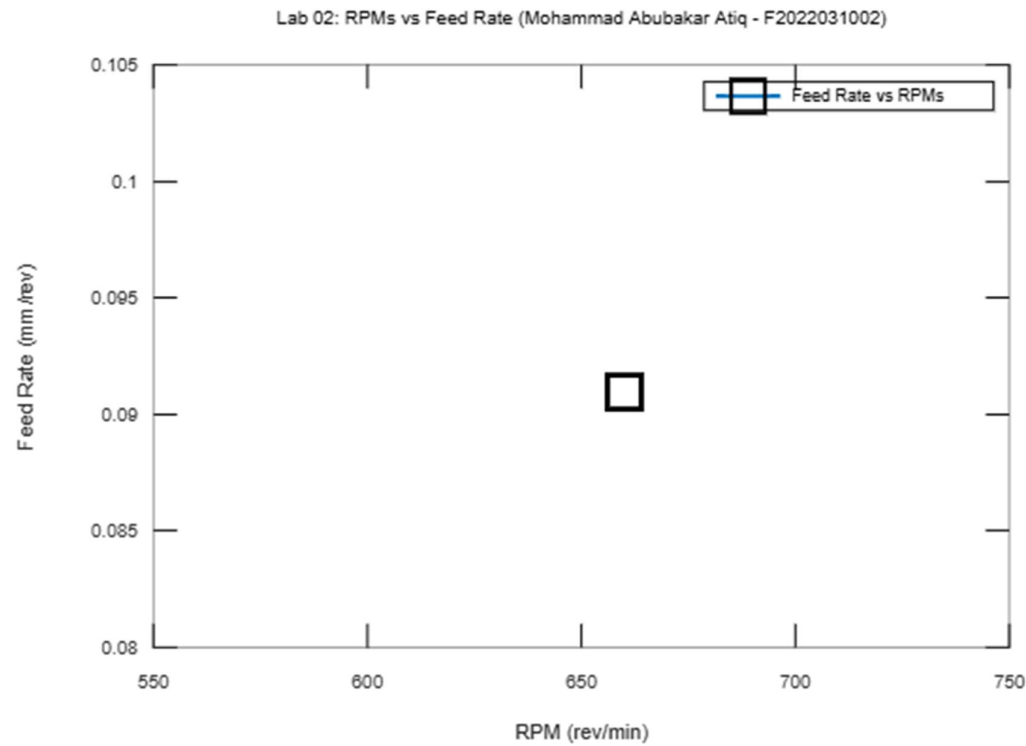
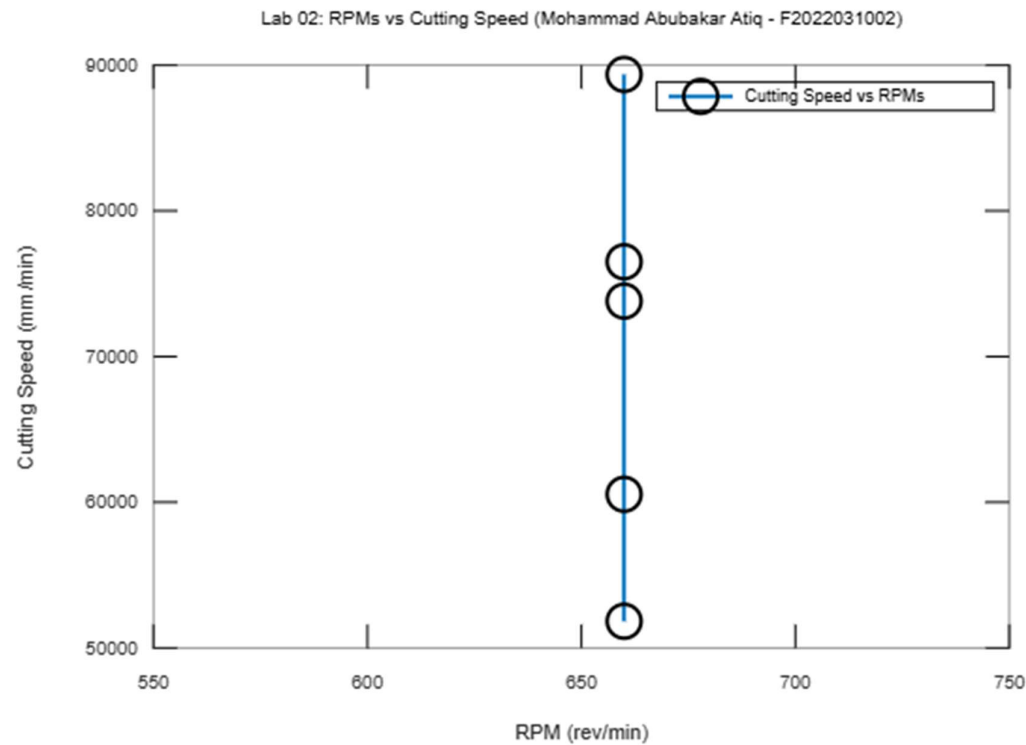
% 5. Plot: Machining Time vs Actual Time

```

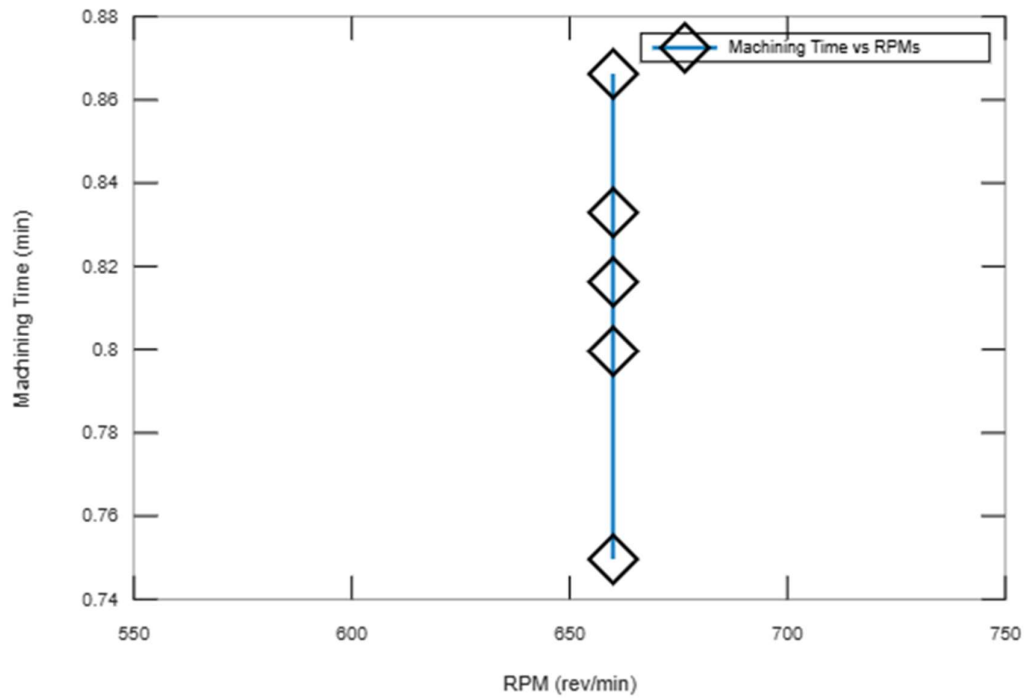
figure;
plot(Tm, Ta, '-x', 'LineWidth', 2);
xlabel('Machining Time (min)');
ylabel('Actual Time (min)');
title('Lab 02: Machining Time vs Actual Time (Mohammad Abubakar Atiq - F2022031002)');
legend('Actual Time vs Machining Time');
grid on;

```

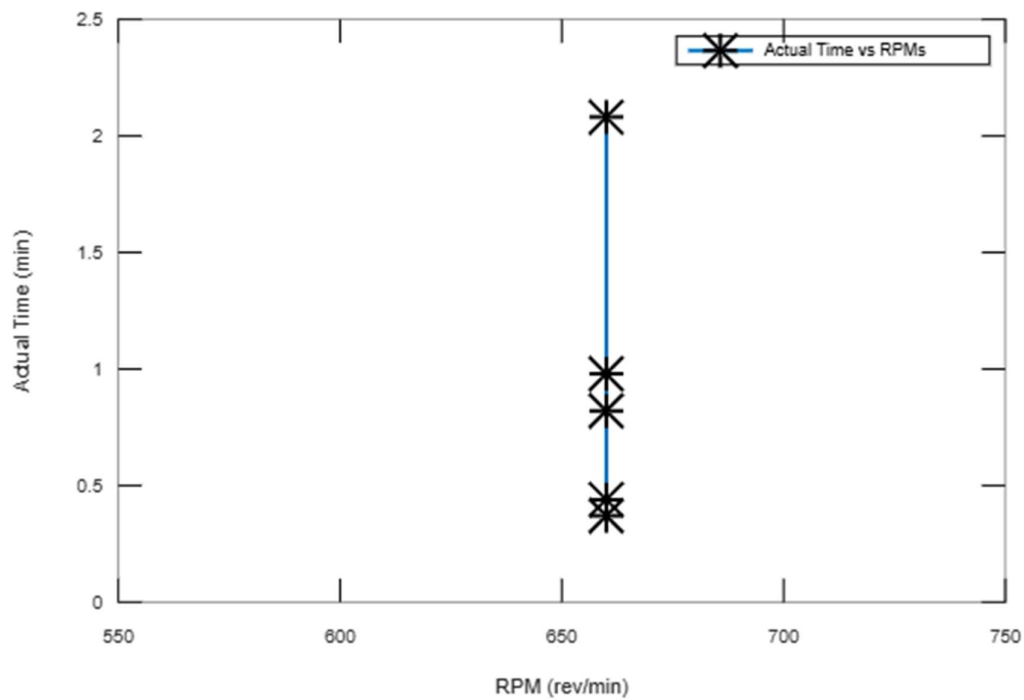
# Graph

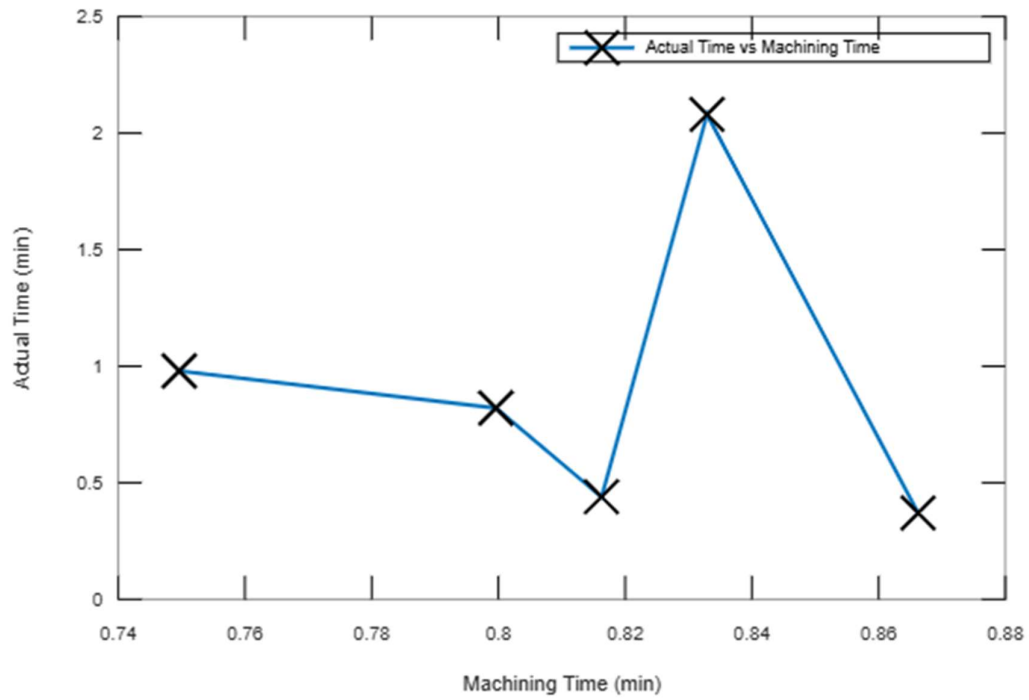


Lab 02: RPMs vs Machining Time (Mohammad Abubakar Atiq - F2022031002)



Lab 02: RPMs vs Actual Time (Mohammad Abubakar Atiq - F2022031002)





## 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.

Plot 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: Mohammad Abubakar Atiq (F2022031002)
```

```
% 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 (Mohammad Abubakar Atiq - F2022031002)');
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 (Mohammad Abubakar Atiq - F2022031002)');
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 (Mohammad Abubakar Atiq - F2022031002)');

```

```

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 (Mohammad Abubakar Atiq - F2022031002)');

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 (Mohammad Abubakar Atiq - F2022031002)');

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)');

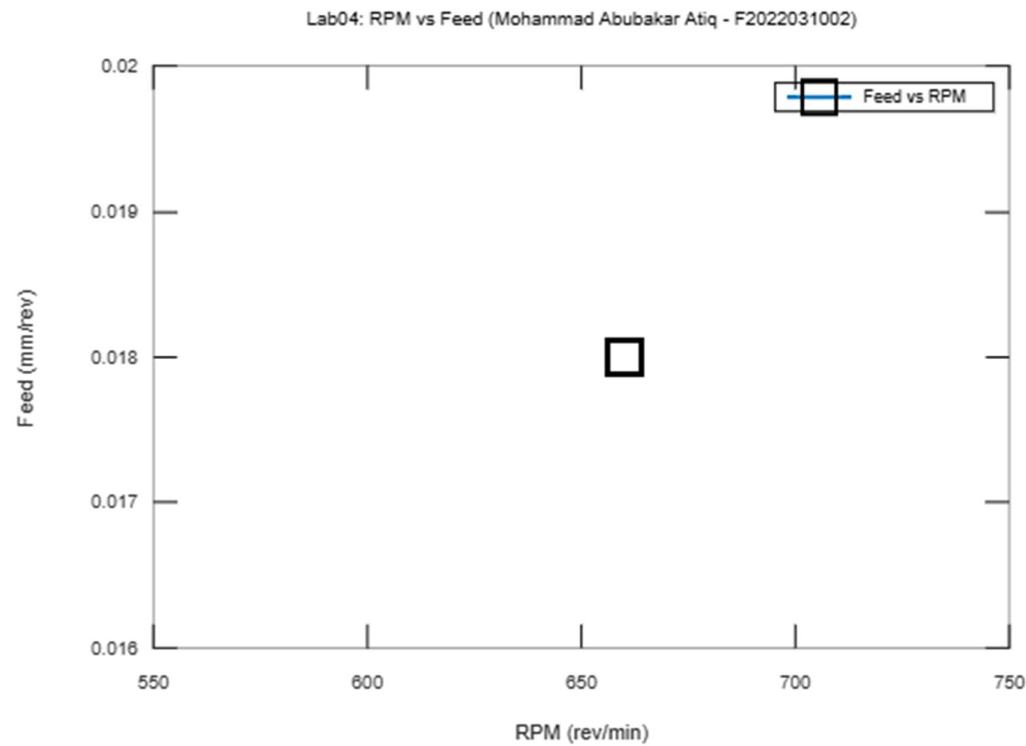
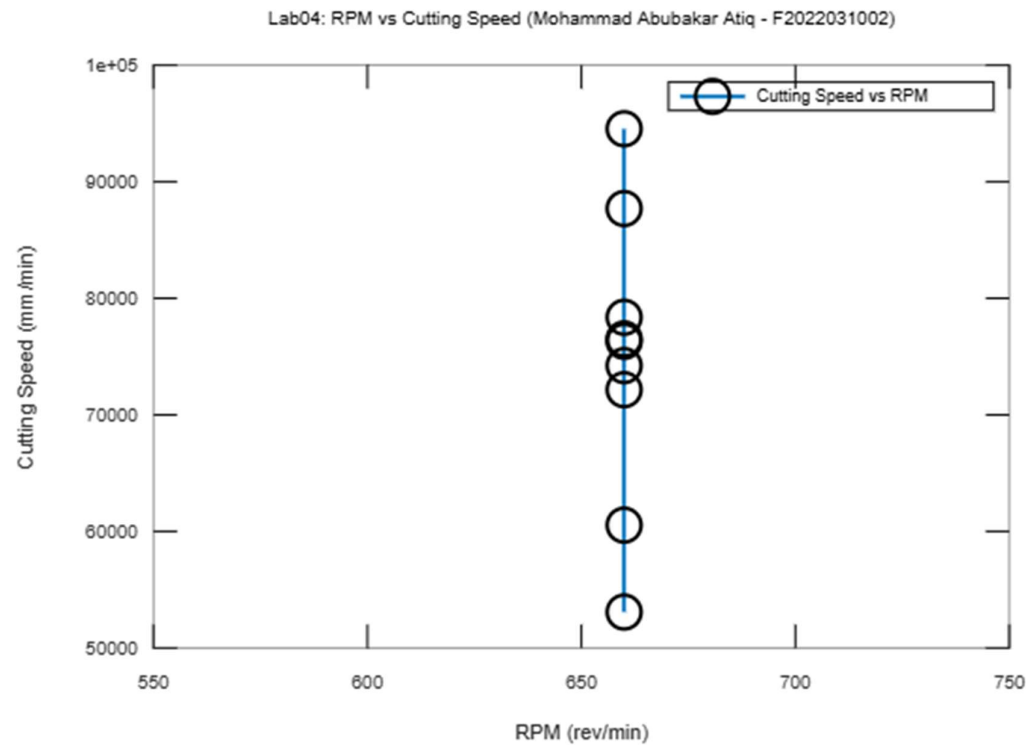
title('Lab04: RPM vs Material Removal Rate (Mohammad Abubakar Atiq - F2022031002)');

legend('Material Removal Rate vs RPM');

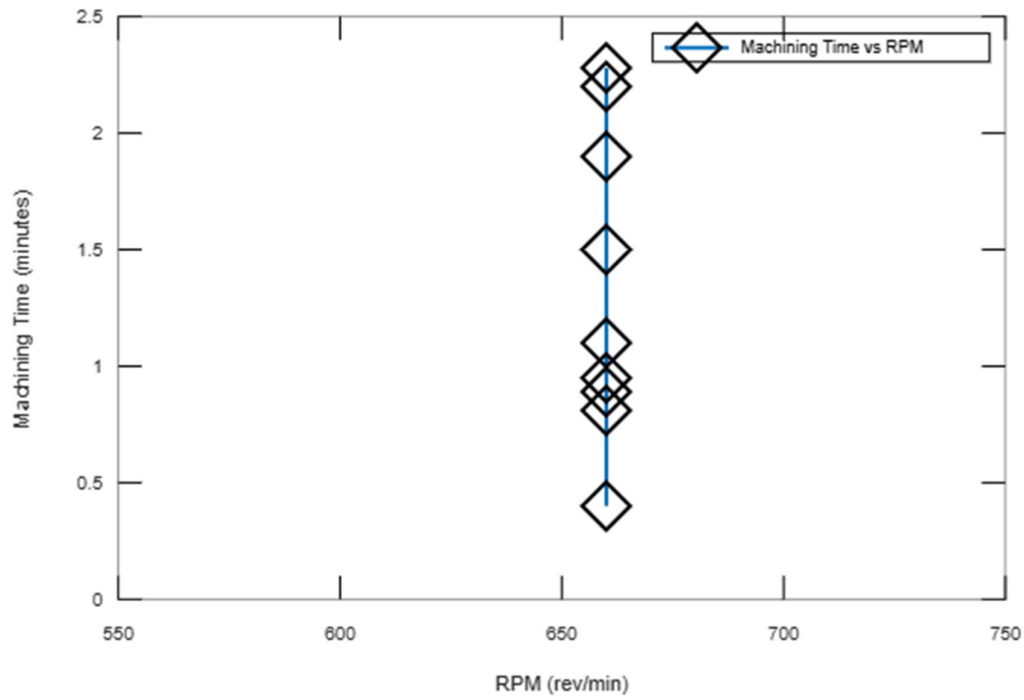
```

grid on;

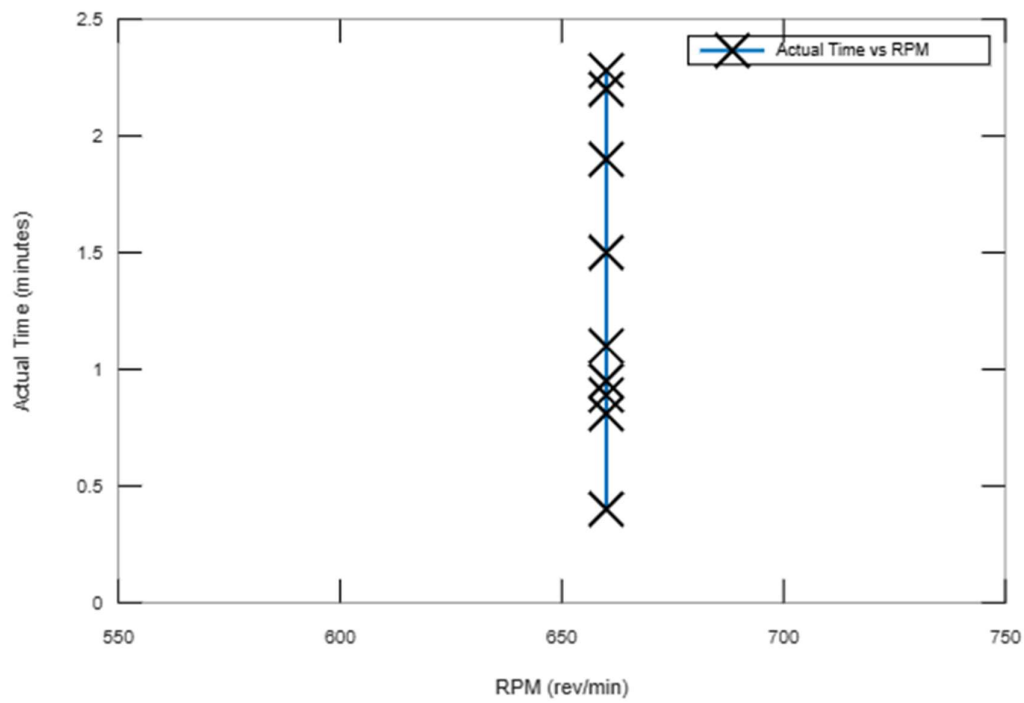
# Graphs



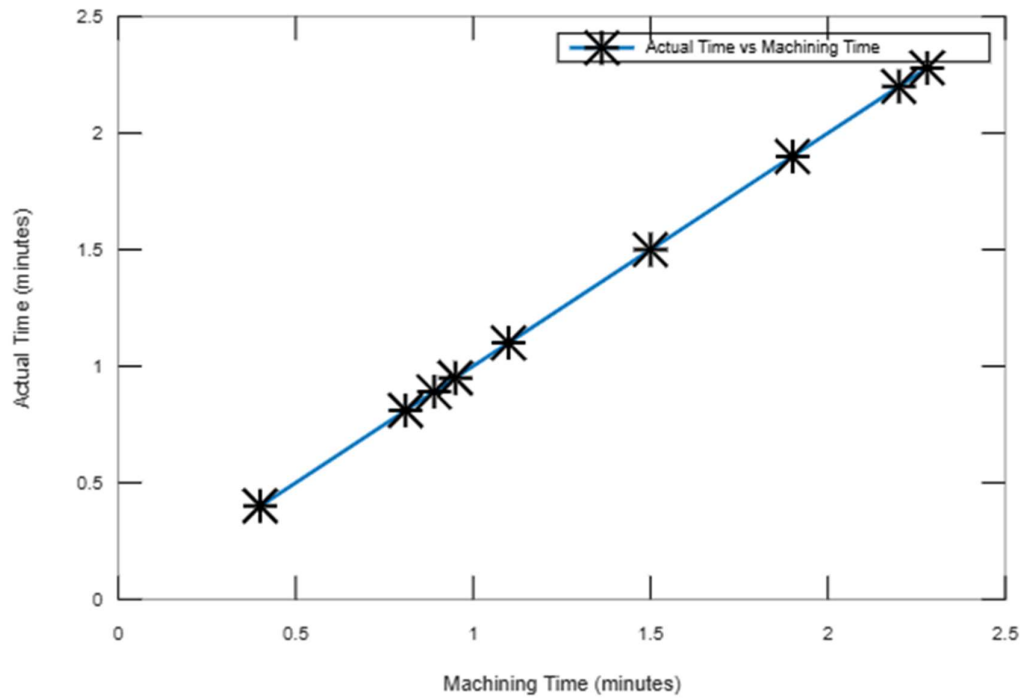
Lab04: RPM vs Machining Time (Mohammad Abubakar Atiq - F2022031002)



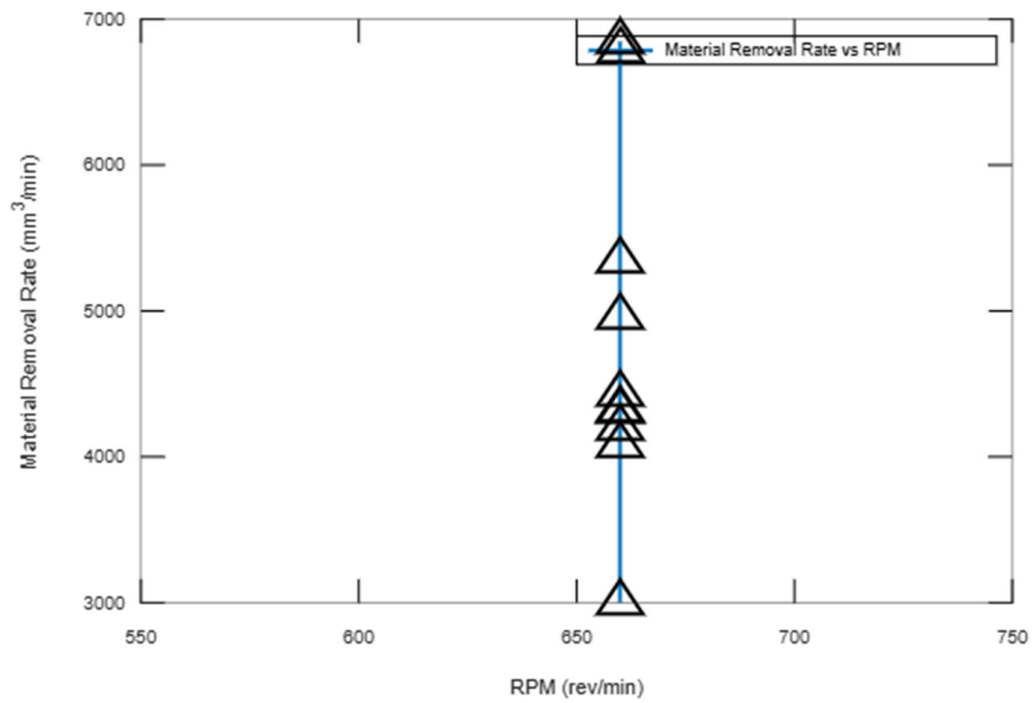
Lab04: RPM vs Actual Time (Mohammad Abubakar Atiq - F2022031002)



Lab04: Machining Time vs Actual Time (Mohammad Abubakar Atiq - F2022031002)



Lab04: RPM vs Material Removal Rate (Mohammad Abubakar Atiq - F2022031002)



Comments:


## 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: Mohammad Abubakar Atiq (F2022031002)

% 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 (Mohammad Abubakar Atiq - F2022031002)');  
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 (Mohammad Abubakar Atiq -  
F2022031002)');  
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)');
```

```

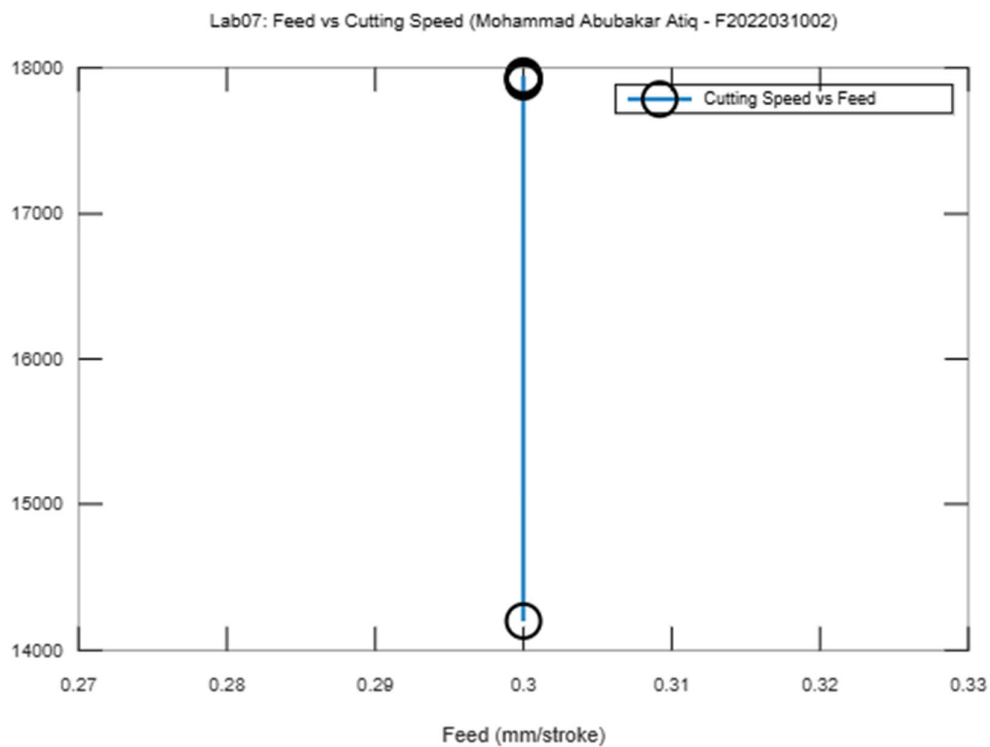
title('Lab07: Cutting Speed vs Actual Machining Time (Mohammad Abubakar Atiq - F2022031002)');
legend('Actual Machining Time vs Cutting Speed');

grid on;

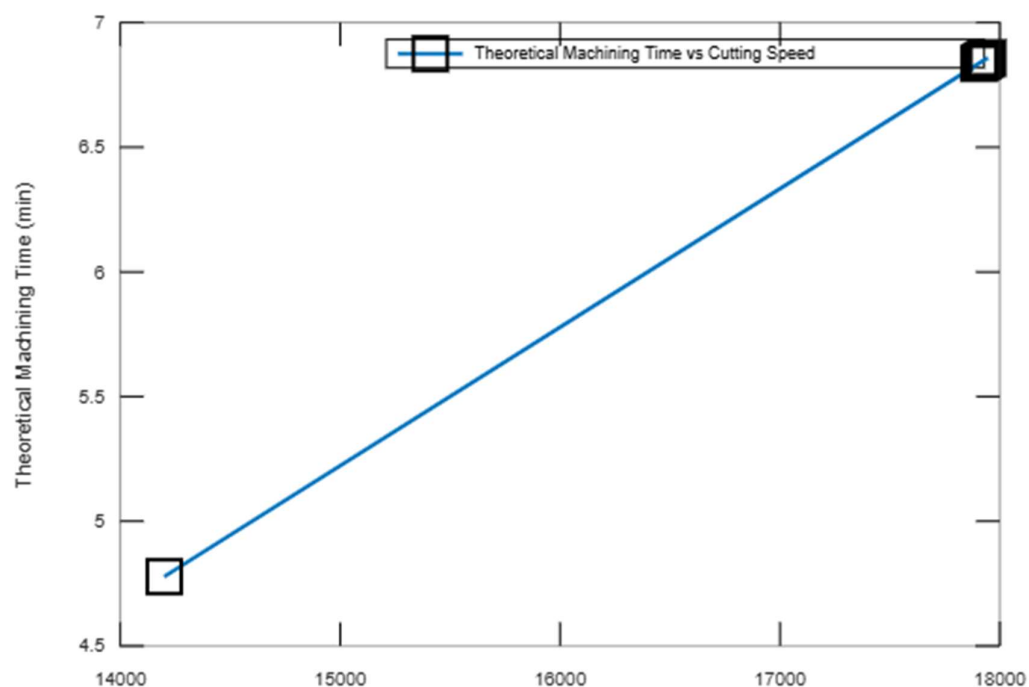
% Plot: Actual vs Theoretical Machining Time
figure;
plot(Theoretical_Machining_Time', Actual_Machining_Time', '-x', 'LineWidth',2);
xlabel('Theoretical Machining Time (min)');
ylabel('Actual Machining Time (min)');
title('Lab07: Actual vs Theoretical Machining Time (Mohammad Abubakar Atiq - F2022031002)');
legend('Actual Time vs Theoretical Time');
grid on;

```

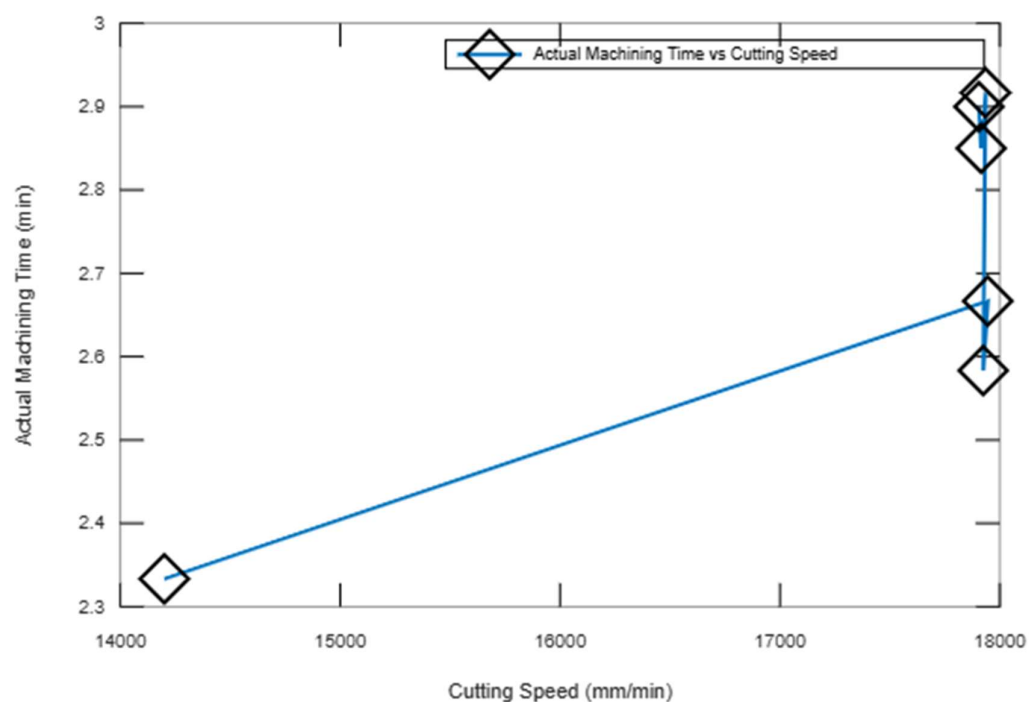
## GRAPHS:



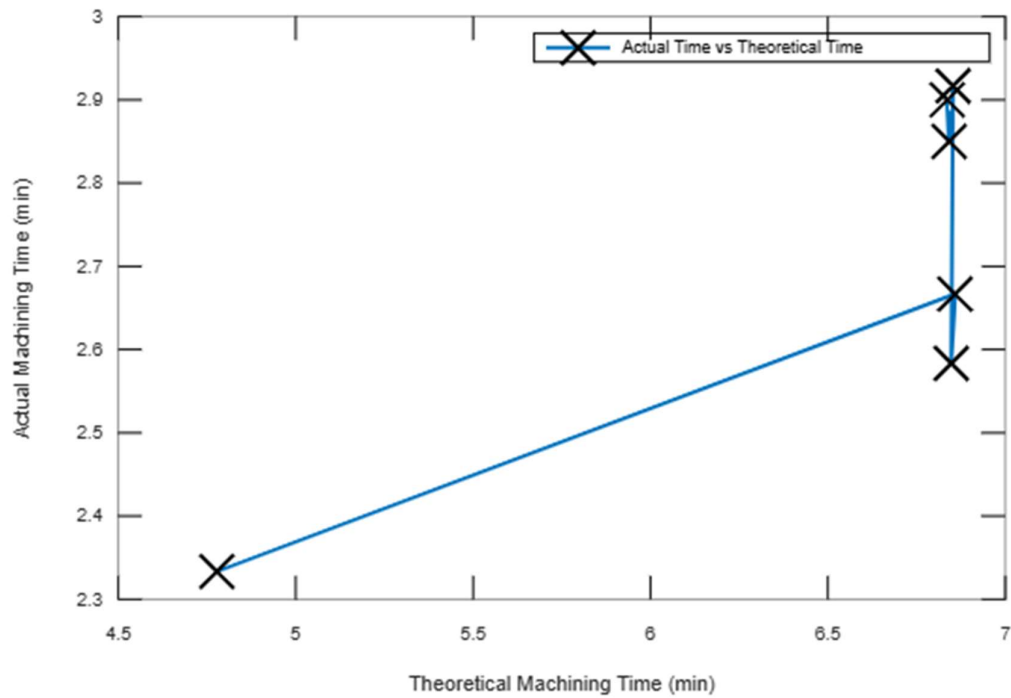
Lab07: Cutting Speed vs Theoretical Machining Time (Mohammad Abubakar Atiq - F2022031002)



Lab07: Cutting Speed vs Actual Machining Time (Mohammad Abubakar Atiq - F2022031002)



Lab07: Actual vs Theoretical Machining Time (Mohammad Abubakar Atiq - F2022031002)



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: (Mohammad Abubakar Atiq - F2022031002)
```

```
% 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 (Mohammad Abubakar Atiq - F2022031002)');
```

```
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 (Mohammad Abubakar Atiq - F2022031002)');
```

```
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 (Mohammad Abubakar Atiq - F2022031002)');
legend('Feed Rate vs Cutting Speed');
grid on;

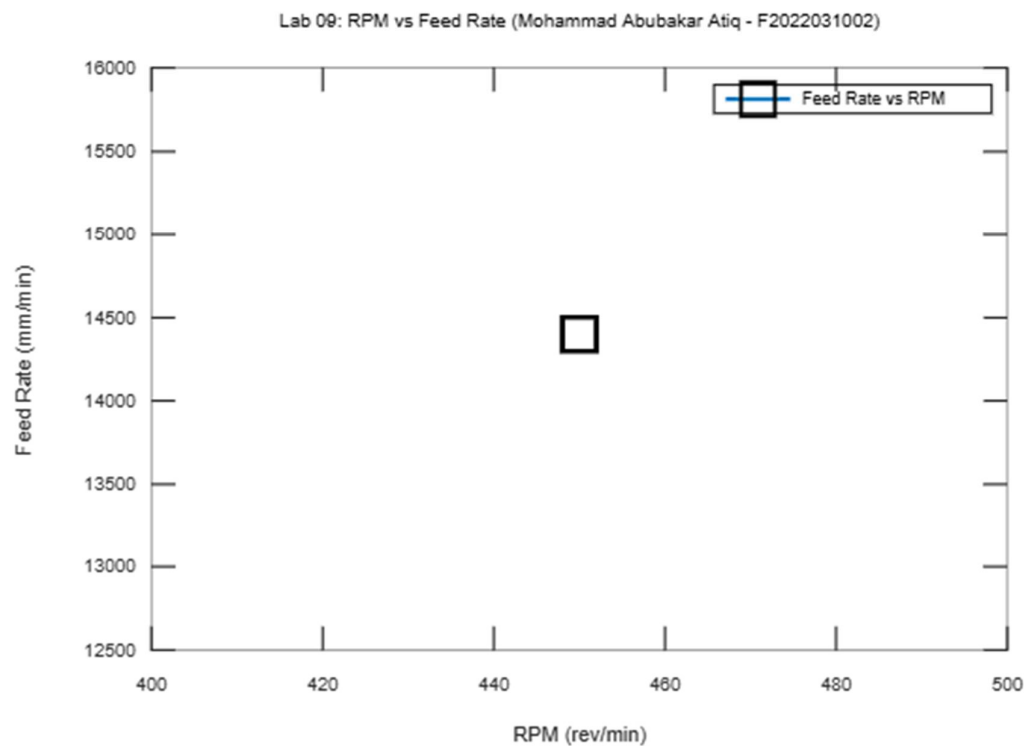
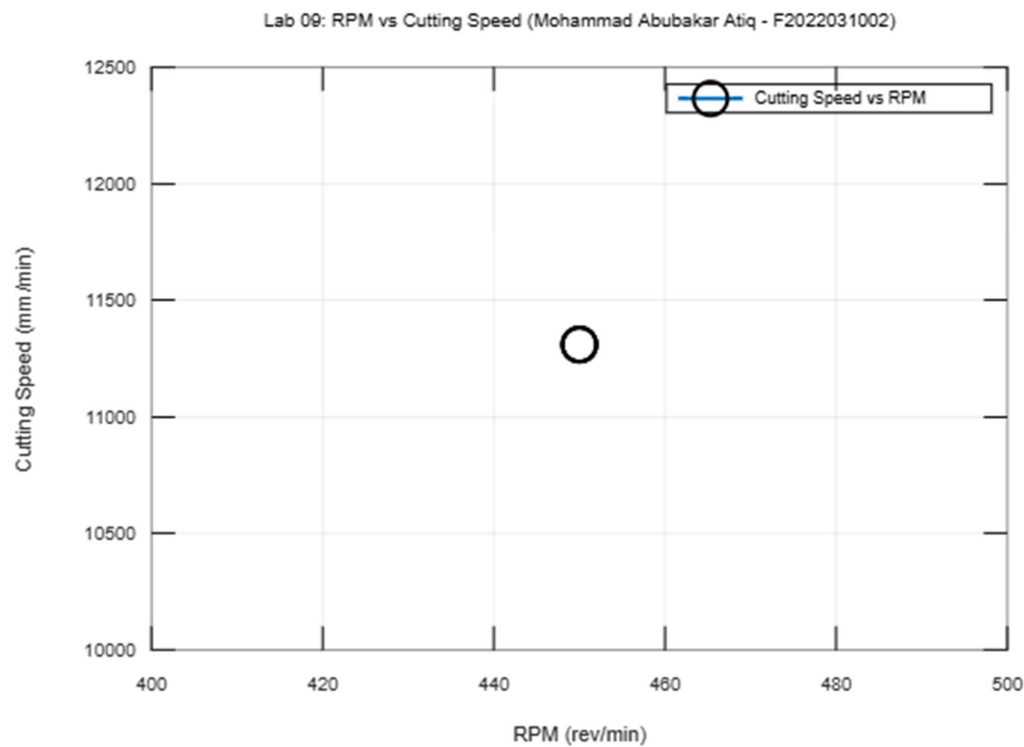
% 4. Plot: Actual vs Theoretical Machining Time
figure;
plot(T_theoretical, T_actual, '-*', 'LineWidth', 2);
xlabel('Theoretical Machining Time (min)');
ylabel('Actual Machining Time (min)');
title('Lab 09: Actual vs Theoretical Machining Time (Mohammad Abubakar Atiq - F2022031002)');
legend('Actual 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 (Mohammad Abubakar Atiq - F2022031002)');
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 (Mohammad Abubakar Atiq - F2022031002)');
legend('Actual Time vs Feed Rate');
grid on;

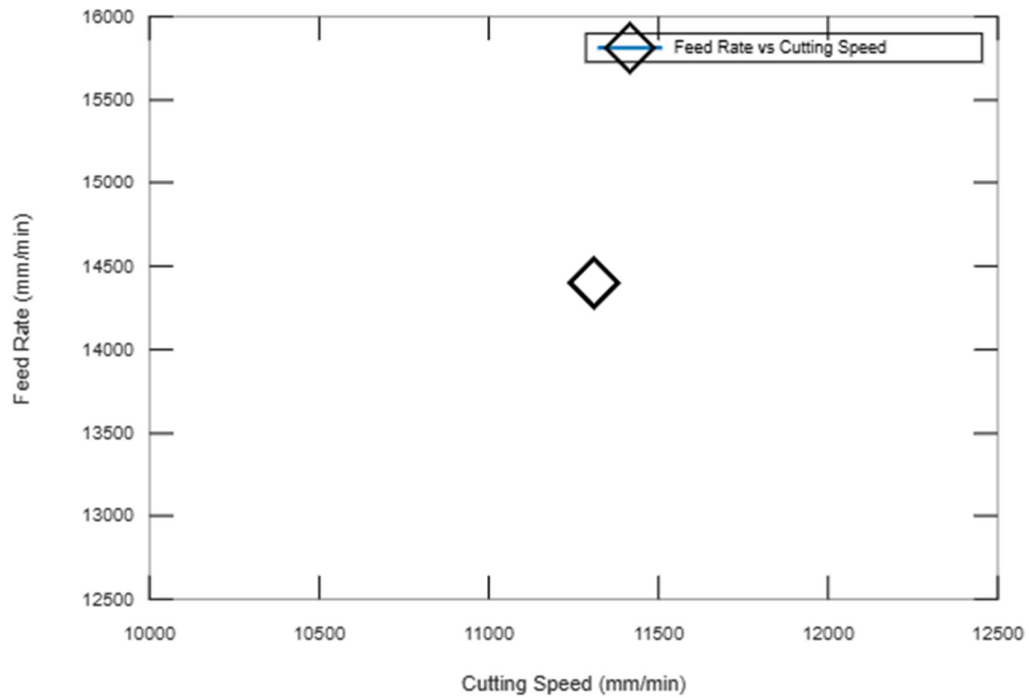
```

Graphs:

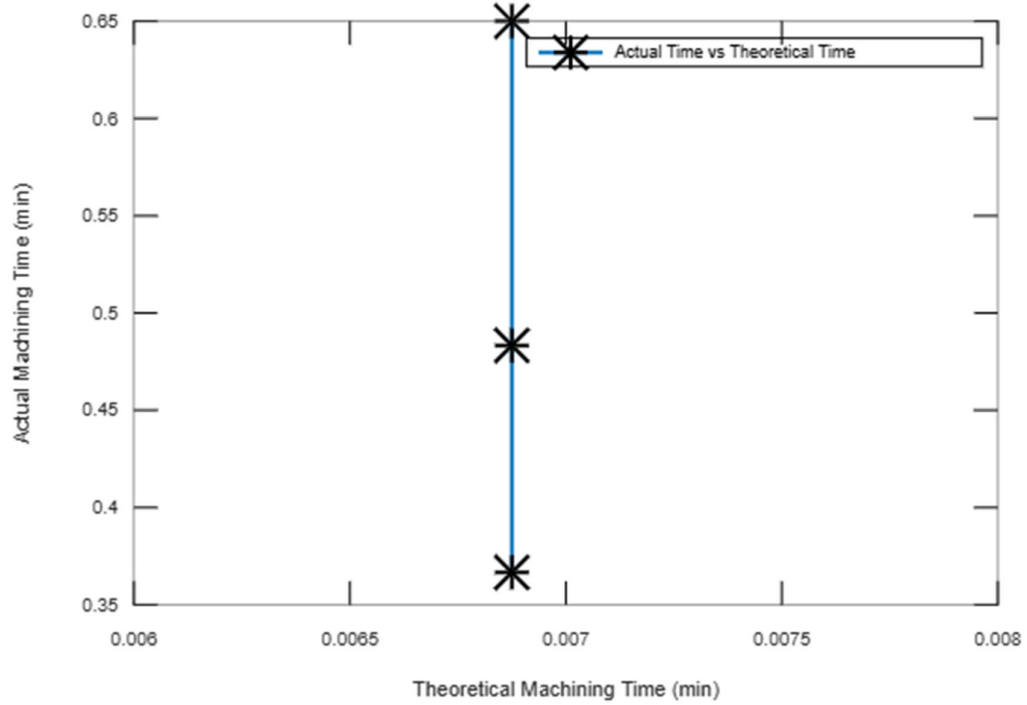




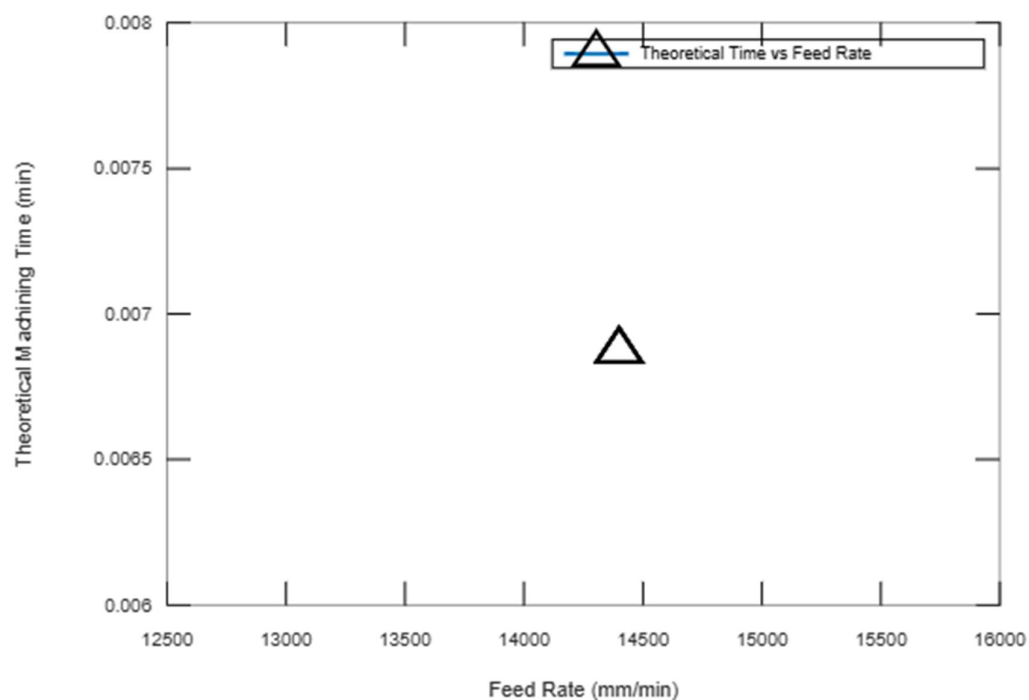
Lab 09: Cutting Speed vs Feed Rate (Mohammad Abubakar Atiq - F2022031002)



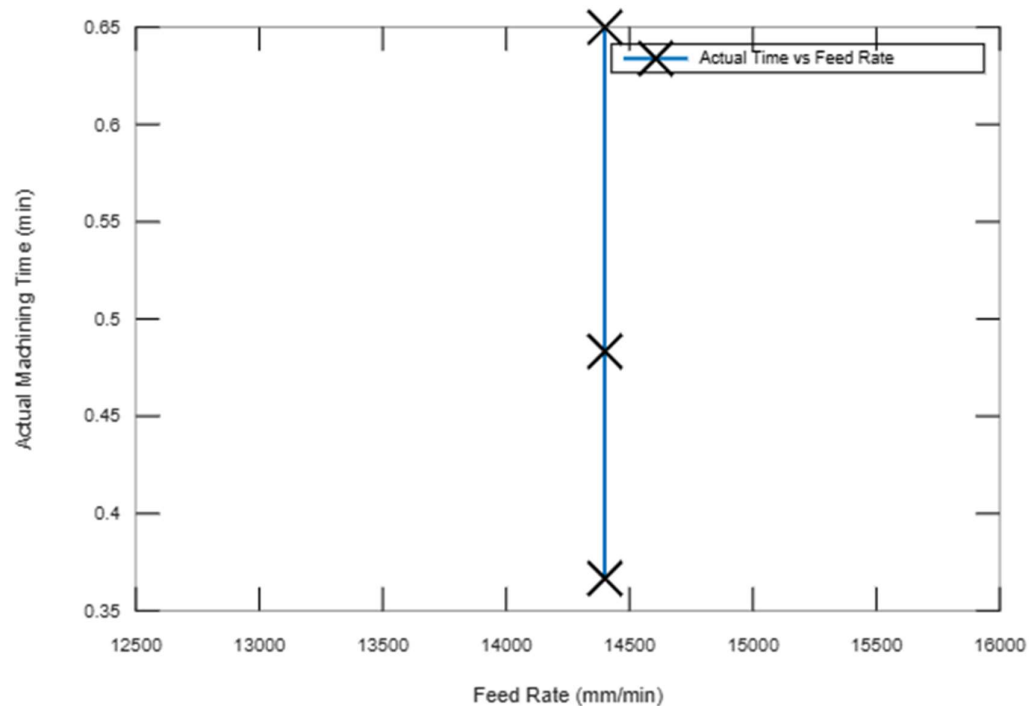
Lab 09: Actual vs Theoretical Machining Time (Mohammad Abubakar Atiq - F2022031002)



Lab 09: Feed Rate vs Theoretical Machining Time (Mohammad Abubakar Atiq - F2022031002)



Lab 09: Feed Rate vs Actual Machining Time (Mohammad Abubakar Atiq - F2022031002)



Comments:
