Project - 4 (DATASET: Breast Cancer Prediction)

In [1]:

```
import pandas as pd
from matplotlib import pyplot as plt
%matplotlib inline
```

In [2]:

```
df=pd.read_csv(r"C:\Users\USER\Downloads\BreastCancerPrediction.csv")
df
```

Out[2]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_m
0	842302	M	17.99	10.38	122.80	1001.0	0.11840	0.27760	0.3
1	842517	M	20.57	17.77	132.90	1326.0	0.08474	0.07864	0.0
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960	0.15990	0.1
3	84348301	M	11.42	20.38	77.58	386.1	0.14250	0.28390	0.2
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030	0.13280	0.1
...	...	...	...	...	...	...	...	...	
564	926424	M	21.56	22.39	142.00	1479.0	0.11100	0.11590	0.2
565	926682	M	20.13	28.25	131.20	1261.0	0.09780	0.10340	0.1
566	926954	M	16.60	28.08	108.30	858.1	0.08455	0.10230	0.0
567	927241	M	20.60	29.33	140.10	1265.0	0.11780	0.27700	0.3
568	92751	B	7.76	24.54	47.92	181.0	0.05263	0.04362	0.0

569 rows × 33 columns

In [3]:

```
df.head()
```

Out[3]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mea
0	842302	M	17.99	10.38	122.80	1001.0	0.11840	0.27760	0.30
1	842517	M	20.57	17.77	132.90	1326.0	0.08474	0.07864	0.08
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960	0.15990	0.19
3	84348301	M	11.42	20.38	77.58	386.1	0.14250	0.28390	0.24
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030	0.13280	0.19

5 rows × 33 columns

In [4]:

```
df.tail()
```

Out[4]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mea
564	926424	M	21.56	22.39	142.00	1479.0	0.11100	0.11590	0.243
565	926682	M	20.13	28.25	131.20	1261.0	0.09780	0.10340	0.144
566	926954	M	16.60	28.08	108.30	858.1	0.08455	0.10230	0.092
567	927241	M	20.60	29.33	140.10	1265.0	0.11780	0.27700	0.351
568	92751	B	7.76	24.54	47.92	181.0	0.05263	0.04362	0.000

5 rows × 33 columns

In [5]:
```
df.drop(['Unnamed: 32'],axis=1)
```

Out[5]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_m
0	842302	M	17.99	10.38	122.80	1001.0	0.11840	0.27760	0.3
1	842517	M	20.57	17.77	132.90	1326.0	0.08474	0.07864	0.0
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960	0.15990	0.1
3	84348301	M	11.42	20.38	77.58	386.1	0.14250	0.28390	0.2
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030	0.13280	0.1
...	...	...	...	...	...	...	...	...	
564	926424	M	21.56	22.39	142.00	1479.0	0.11100	0.11590	0.2
565	926682	M	20.13	28.25	131.20	1261.0	0.09780	0.10340	0.1
566	926954	M	16.60	28.08	108.30	858.1	0.08455	0.10230	0.0
567	927241	M	20.60	29.33	140.10	1265.0	0.11780	0.27700	0.3
568	92751	B	7.76	24.54	47.92	181.0	0.05263	0.04362	0.0

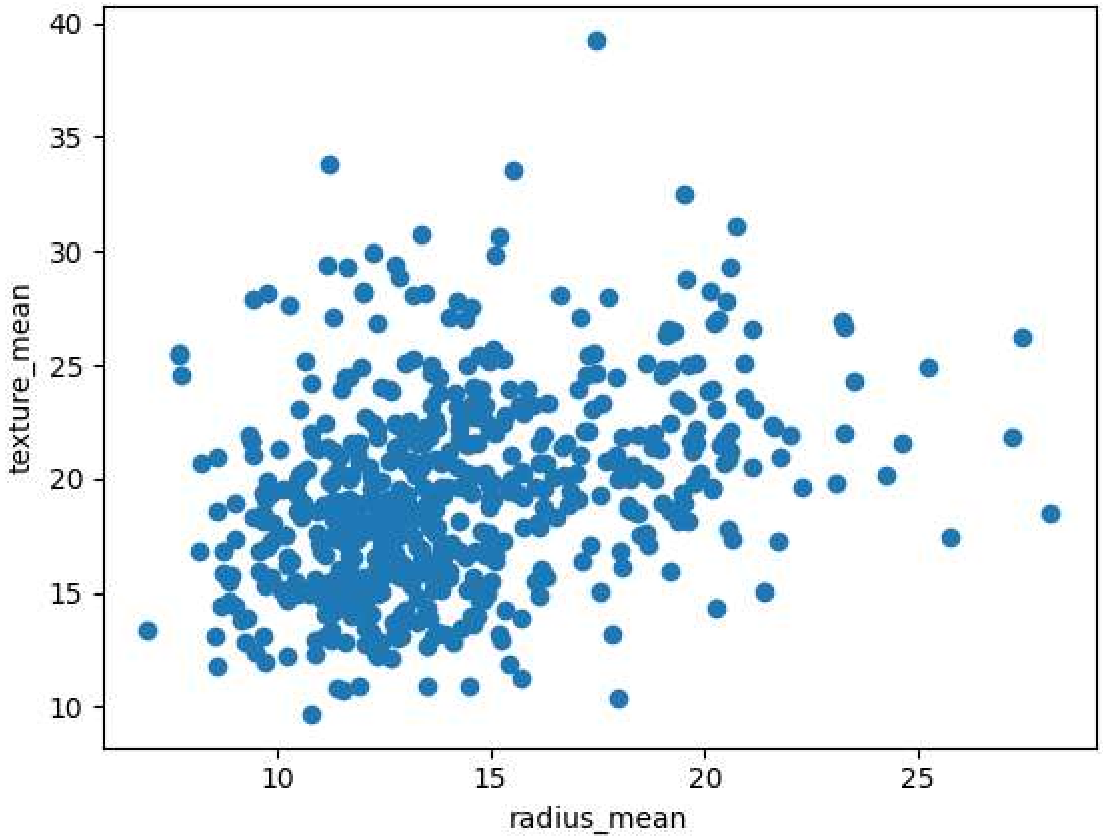
569 rows × 32 columns

In [6]:

```
plt.scatter(df["radius_mean"],df["texture_mean"])
plt.xlabel("radius_mean")
plt.ylabel("texture_mean")
```

Out[6]:

```
Text(0, 0.5, 'texture_mean')
```



In [9]:

```
from sklearn.cluster import KMeans
km=KMeans()
km
```

Out[9]:

```
▾ KMeans
KMeans()
```

In [10]:
```
y_predicted=km.fit_predict(df[["radius_mean","texture_mean"]])
y_predicted
```

```
C:\Users\USER\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Futu
reWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` exp
licitly to suppress the warning
  warnings.warn(
```

Out[10]:
```
array([6, 4, 4, 5, 4, 6, 4, 0, 7, 7, 7, 0, 2, 7, 7, 3, 0, 0, 4, 6, 6, 1,
       6, 2, 0, 6, 0, 4, 7, 6, 2, 5, 2, 2, 0, 0, 7, 5, 7, 0, 7, 5, 2, 0,
       7, 4, 5, 5, 1, 7, 7, 6, 5, 4, 0, 5, 4, 0, 5, 1, 1, 5, 7, 1, 7, 7,
       5, 5, 5, 6, 4, 1, 2, 6, 6, 0, 1, 6, 2, 5, 5, 6, 2, 2, 1, 4, 0, 2,
       7, 6, 7, 7, 6, 5, 0, 2, 5, 5, 1, 0, 7, 1, 5, 5, 5, 6, 5, 5, 4, 5,
       5, 5, 0, 5, 1, 7, 1, 6, 7, 4, 1, 4, 4, 1, 6, 6, 7, 4, 6, 2, 1, 0,
       0, 6, 4, 7, 5, 1, 6, 1, 1, 0, 5, 6, 1, 1, 5, 0, 6, 6, 0, 5, 1, 1,
       6, 5, 4, 0, 1, 1, 5, 4, 4, 7, 4, 0, 1, 0, 2, 6, 1, 0, 6, 1, 1, 1,
       5, 0, 7, 1, 4, 2, 0, 1, 7, 1, 4, 5, 5, 6, 7, 7, 5, 3, 7, 6, 7, 4,
       4, 0, 5, 0, 2, 7, 5, 6, 5, 0, 7, 6, 4, 5, 4, 2, 7, 6, 5, 5, 4, 2,
       6, 6, 5, 0, 6, 6, 1, 6, 7, 7, 0, 3, 3, 2, 1, 0, 2, 4, 3, 3, 6, 1,
       5, 7, 2, 5, 6, 1, 7, 1, 2, 5, 4, 6, 4, 6, 2, 6, 7, 3, 2, 2, 0, 0,
       0, 2, 5, 7, 6, 5, 6, 1, 4, 1, 2, 5, 1, 4, 6, 6, 2, 1, 4, 0, 6, 5,
       5, 1, 5, 5, 0, 0, 6, 5, 1, 6, 1, 5, 0, 7, 4, 5, 2, 5, 5, 7, 6, 1,
       1, 1, 5, 6, 1, 1, 5, 5, 1, 4, 5, 5, 1, 4, 1, 4, 1, 5, 6, 5, 0, 0,
       6, 5, 5, 1, 5, 0, 6, 4, 5, 2, 6, 5, 1, 4, 1, 1, 5, 6, 1, 1, 5, 0,
       4, 7, 1, 5, 5, 6, 1, 5, 5, 7, 5, 0, 6, 4, 2, 5, 4, 4, 7, 6, 4, 4,
       6, 6, 5, 3, 6, 5, 1, 1, 7, 5, 6, 7, 1, 6, 1, 2, 1, 5, 0, 4, 5, 6,
       0, 5, 1, 5, 4, 1, 5, 6, 1, 5, 6, 7, 4, 5, 5, 5, 5, 7, 3, 7, 5, 0,
       1, 5, 5, 6, 1, 0, 5, 5, 1, 7, 5, 5, 7, 5, 4, 4, 6, 0, 5, 6, 0, 6,
       5, 2, 6, 5, 4, 7, 2, 6, 0, 4, 7, 2, 3, 6, 5, 3, 3, 7, 7, 3, 2, 2,
       3, 5, 5, 0, 0, 5, 2, 5, 5, 3, 6, 3, 1, 6, 0, 6, 1, 0, 5, 0, 6, 6,
       6, 6, 6, 4, 1, 0, 7, 6, 4, 1, 0, 0, 5, 5, 4, 4, 6, 7, 6, 4, 1, 1,
       5, 5, 6, 7, 1, 6, 0, 6, 0, 5, 4, 4, 5, 6, 1, 4, 5, 0, 1, 1, 0, 1,
       6, 1, 5, 5, 6, 4, 5, 4, 7, 7, 3, 3, 1, 7, 7, 3, 0, 7, 5, 5, 5, 7,
       5, 7, 3, 5, 3, 3, 5, 3, 7, 7, 3, 3, 3, 2, 4, 2, 2, 2, 7])
```

In [11]:
```
df["cluster"]=y_predicted
df.head()
```

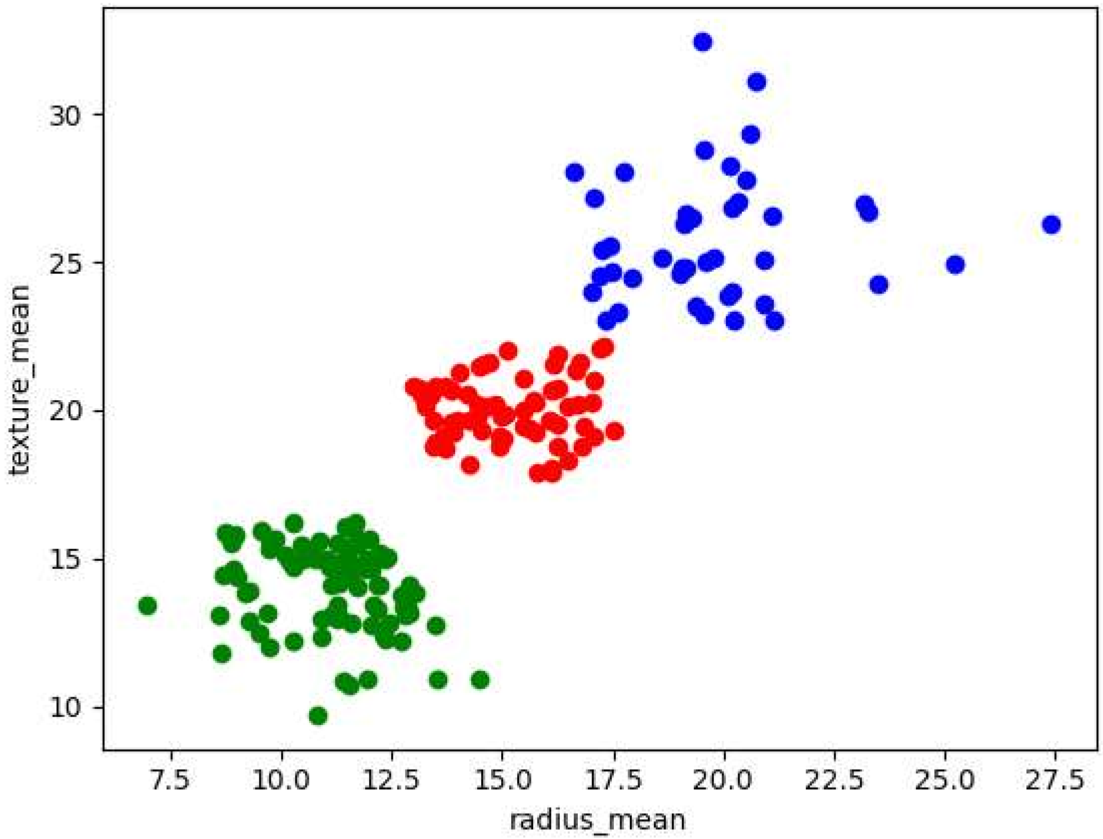
Out[11]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mea
0	842302	M	17.99	10.38	122.80	1001.0	0.11840	0.27760	0.30
1	842517	M	20.57	17.77	132.90	1326.0	0.08474	0.07864	0.08
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960	0.15990	0.19
3	84348301	M	11.42	20.38	77.58	386.1	0.14250	0.28390	0.24
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030	0.13280	0.19

5 rows × 34 columns

In [12]:
```
df1=df[df.cluster==0]
df2=df[df.cluster==1]
df3=df[df.cluster==2]
plt.scatter(df1["radius_mean"],df1["texture_mean"],color="red")
plt.scatter(df2["radius_mean"],df2["texture_mean"],color="green")
plt.scatter(df3["radius_mean"],df3["texture_mean"],color="blue")
plt.xlabel("radius_mean")
plt.ylabel("texture_mean")
```

Out[12]:
```
Text(0, 0.5, 'texture_mean')
```



In [13]:

```
from sklearn.preprocessing import MinMaxScaler
scaler=MinMaxScaler()
scaler.fit(df[["texture_mean"]])
df["texture_mean"]=scaler.transform(df[["texture_mean"]])
df.head()
```

Out[13]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mea
0	842302	M	17.99	0.022658	122.80	1001.0	0.11840	0.27760	0.30
1	842517	M	20.57	0.272574	132.90	1326.0	0.08474	0.07864	0.08
2	84300903	M	19.69	0.390260	130.00	1203.0	0.10960	0.15990	0.19
3	84348301	M	11.42	0.360839	77.58	386.1	0.14250	0.28390	0.24
4	84358402	M	20.29	0.156578	135.10	1297.0	0.10030	0.13280	0.19

5 rows × 34 columns

In [14]:

```
scaler.fit(df[["radius_mean"]])
df["radius_mean"]=scaler.transform(df[["radius_mean"]])
df.head()
```

Out[14]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mea
0	842302	M	0.521037	0.022658	122.80	1001.0	0.11840	0.27760	0.30
1	842517	M	0.643144	0.272574	132.90	1326.0	0.08474	0.07864	0.08
2	84300903	M	0.601496	0.390260	130.00	1203.0	0.10960	0.15990	0.19
3	84348301	M	0.210090	0.360839	77.58	386.1	0.14250	0.28390	0.24
4	84358402	M	0.629893	0.156578	135.10	1297.0	0.10030	0.13280	0.19

5 rows × 34 columns

In [15]:

```
y_predicted=km.fit_predict(df[["radius_mean","texture_mean"]])
y_predicted
```

```
C:\Users\USER\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Futu
reWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` exp
licitly to suppress the warning
  warnings.warn(
```

Out[15]:

```
array([1, 5, 5, 3, 5, 1, 5, 2, 2, 7, 2, 1, 4, 2, 2, 7, 2, 2, 5, 1, 1, 6,
       1, 0, 2, 5, 2, 5, 2, 1, 4, 3, 4, 4, 1, 2, 2, 3, 7, 2, 2, 3, 4, 2,
       2, 5, 6, 3, 6, 2, 3, 1, 3, 5, 2, 3, 5, 2, 3, 6, 6, 3, 2, 6, 7, 2,
       3, 3, 3, 1, 5, 6, 4, 1, 3, 2, 1, 5, 4, 3, 3, 1, 0, 4, 6, 5, 2, 4,
       2, 1, 2, 2, 1, 3, 2, 4, 3, 3, 6, 2, 7, 6, 3, 3, 3, 1, 3, 3, 0, 3,
       3, 2, 2, 3, 6, 3, 6, 1, 2, 5, 6, 5, 0, 1, 1, 1, 7, 5, 1, 4, 6, 2,
       2, 1, 5, 2, 3, 6, 1, 6, 6, 1, 3, 1, 6, 6, 3, 2, 1, 1, 2, 3, 6, 6,
       1, 3, 5, 5, 6, 6, 3, 5, 5, 2, 0, 2, 6, 5, 4, 1, 6, 2, 1, 6, 6, 6,
       3, 2, 2, 1, 0, 4, 2, 6, 2, 6, 5, 3, 3, 1, 2, 2, 3, 7, 2, 1, 2, 5,
       5, 2, 3, 5, 0, 2, 3, 1, 3, 5, 2, 1, 5, 3, 0, 4, 2, 1, 3, 3, 5, 4,
       1, 1, 3, 2, 1, 1, 6, 1, 7, 2, 5, 7, 7, 4, 6, 2, 0, 5, 7, 4, 1, 1,
       3, 2, 4, 3, 1, 1, 7, 6, 4, 3, 5, 5, 5, 1, 4, 1, 2, 7, 4, 5, 5, 2,
       5, 4, 3, 2, 1, 3, 1, 6, 0, 6, 4, 3, 6, 5, 1, 1, 4, 6, 5, 2, 1, 3,
       3, 1, 3, 3, 2, 2, 1, 3, 1, 1, 6, 3, 1, 3, 5, 3, 4, 3, 3, 7, 1, 6,
       1, 1, 3, 1, 1, 6, 3, 3, 6, 5, 3, 3, 6, 5, 1, 5, 6, 3, 1, 3, 2, 2,
       1, 3, 3, 6, 3, 5, 1, 5, 3, 0, 1, 6, 6, 5, 6, 6, 3, 1, 6, 6, 3, 2,
       0, 7, 6, 3, 3, 1, 6, 3, 3, 2, 3, 5, 1, 5, 4, 3, 5, 0, 2, 1, 5, 5,
       1, 1, 3, 7, 1, 3, 6, 6, 2, 3, 1, 2, 6, 1, 6, 4, 6, 6, 2, 0, 3, 1,
       2, 3, 6, 3, 5, 6, 3, 1, 6, 3, 1, 2, 5, 3, 3, 3, 3, 2, 7, 3, 3, 2,
       6, 3, 3, 1, 6, 2, 3, 3, 6, 3, 3, 3, 2, 3, 5, 5, 1, 2, 3, 1, 2, 1,
       3, 4, 1, 3, 5, 7, 4, 1, 2, 5, 3, 4, 7, 1, 3, 7, 7, 7, 7, 7, 4, 0,
       7, 3, 3, 2, 2, 3, 4, 3, 3, 7, 1, 7, 6, 1, 2, 1, 6, 2, 3, 2, 1, 1,
       1, 1, 1, 5, 6, 5, 2, 1, 5, 6, 2, 2, 3, 3, 5, 5, 1, 7, 1, 0, 6, 6,
       3, 3, 1, 2, 6, 1, 2, 1, 2, 3, 5, 5, 3, 1, 6, 0, 3, 2, 6, 6, 2, 6,
       1, 6, 3, 3, 1, 5, 3, 5, 2, 7, 7, 7, 6, 7, 7, 7, 2, 2, 6, 6, 3, 7,
       3, 3, 7, 3, 7, 7, 3, 7, 2, 7, 7, 7, 7, 4, 0, 4, 4, 4, 7])
```

In [16]:
```
df["New Cluster"]=y_predicted
df.head()
```

Out[16]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mea
0	842302	M	0.521037	0.022658	122.80	1001.0	0.11840	0.27760	0.30
1	842517	M	0.643144	0.272574	132.90	1326.0	0.08474	0.07864	0.08
2	84300903	M	0.601496	0.390260	130.00	1203.0	0.10960	0.15990	0.19
3	84348301	M	0.210090	0.360839	77.58	386.1	0.14250	0.28390	0.24
4	84358402	M	0.629893	0.156578	135.10	1297.0	0.10030	0.13280	0.19

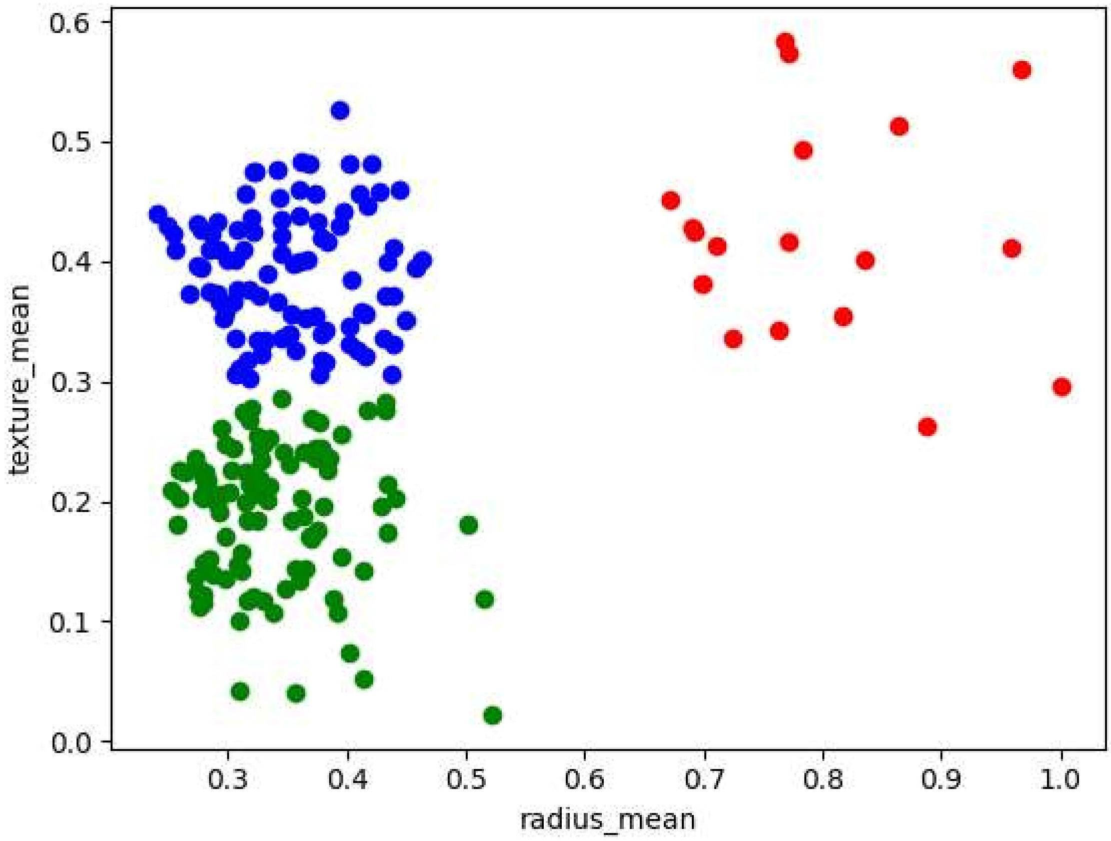
5 rows × 35 columns

In [17]:

```
df1=df[df["New Cluster"]==0]
df2=df[df["New Cluster"]==1]
df3=df[df["New Cluster"]==2]
plt.scatter(df1["radius_mean"],df1["texture_mean"],color="red")
plt.scatter(df2["radius_mean"],df2["texture_mean"],color="green")
plt.scatter(df3["radius_mean"],df3["texture_mean"],color="blue")
plt.xlabel("radius_mean")
plt.ylabel("texture_mean")
```

Out[17]:

```
Text(0, 0.5, 'texture_mean')
```



In [18]:

```
km.cluster_centers_
```

Out[18]:

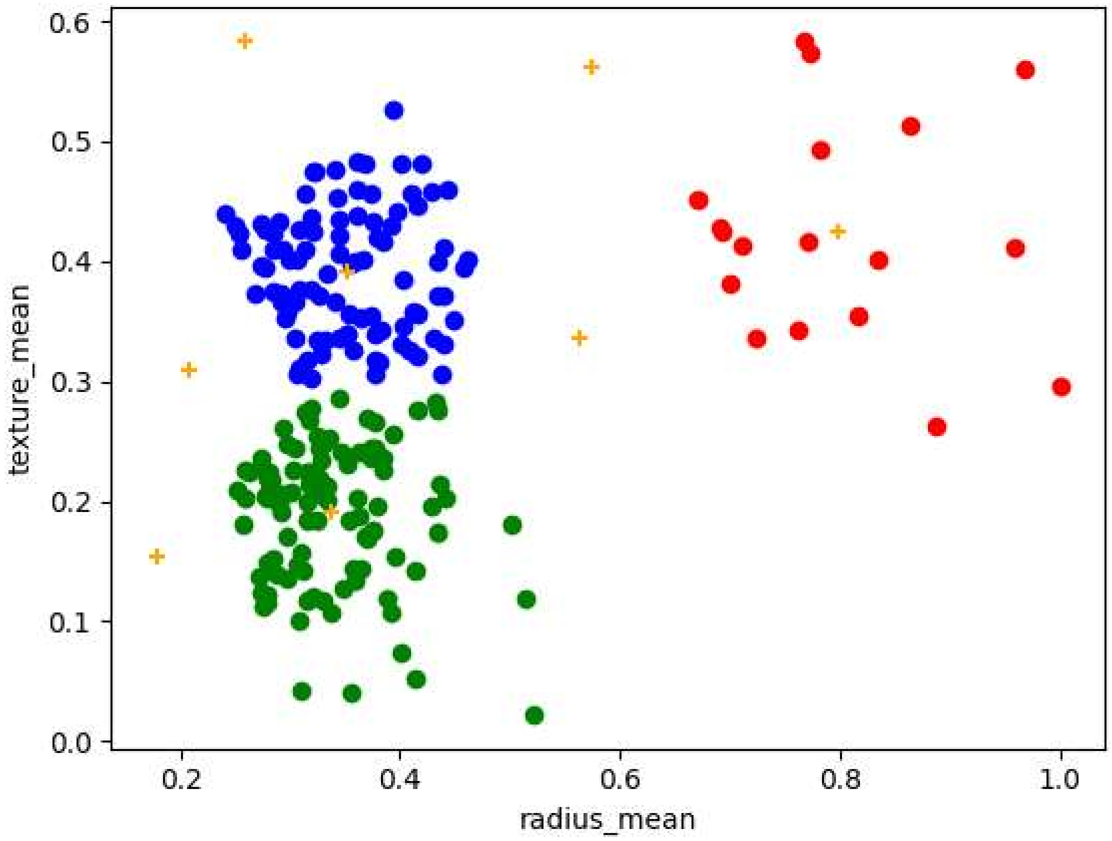
```
array([[0.79840767, 0.42469846],
       [0.33809493, 0.19063439],
       [0.35173159, 0.39188367],
       [0.20867092, 0.3094643 ],
       [0.57355872, 0.56191523],
       [0.56272221, 0.33594655],
       [0.17850466, 0.15444707],
       [0.2590623 , 0.58293879]])
```

In [19]:

```
df1=df[df["New Cluster"]==0]
df2=df[df["New Cluster"]==1]
df3=df[df["New Cluster"]==2]
plt.scatter(df1["radius_mean"],df1["texture_mean"],color="red")
plt.scatter(df2["radius_mean"],df2["texture_mean"],color="green")
plt.scatter(df3["radius_mean"],df3["texture_mean"],color="blue")
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color="orange",marker="+")
plt.xlabel("radius_mean")
plt.ylabel("texture_mean")
```

Out[19]:

```
Text(0, 0.5, 'texture_mean')
```



In [20]:

```
k_rng=range(1,10)
sse=[]
```

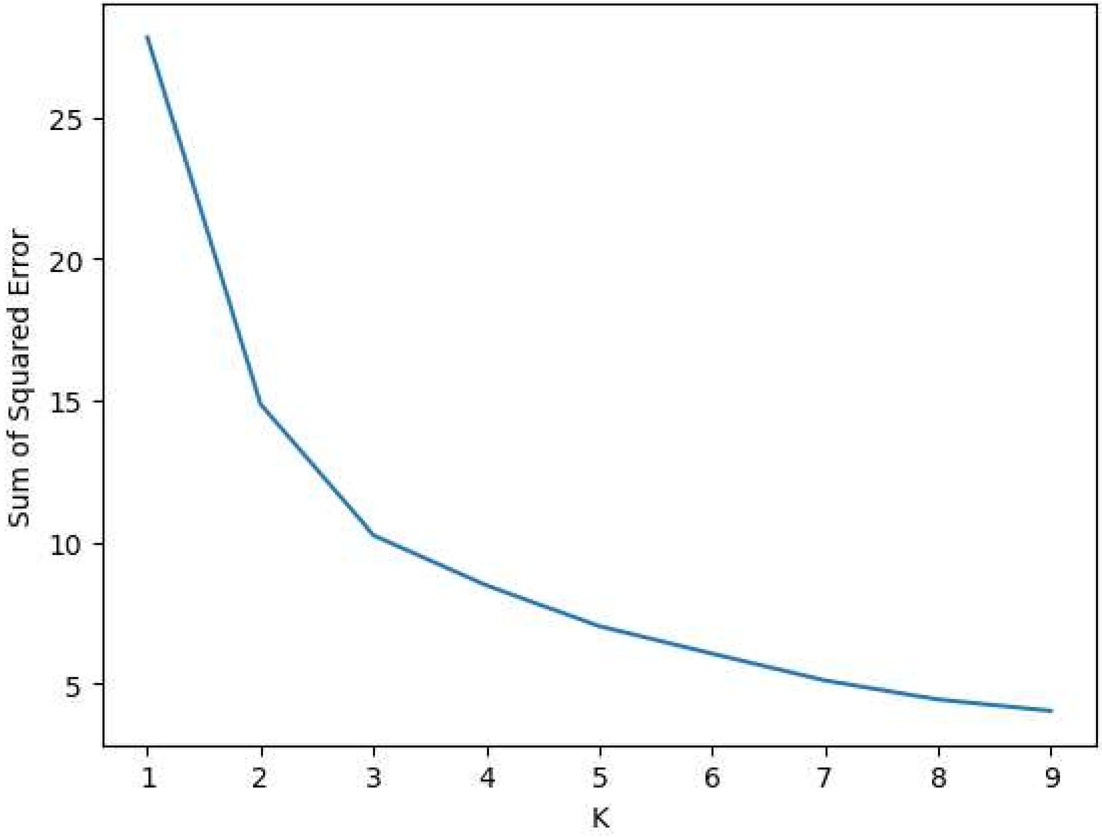
In [21]:

```python
for k in k_rng:
 km=KMeans(n_clusters=k)
 km.fit(df[["radius_mean","texture_mean"]])
 sse.append(km.inertia_)
#km.inertia_ will give you the value of sum of square error
print(sse)
plt.plot(k_rng,sse)
plt.xlabel("K")
plt.ylabel("Sum of Squared Error")
```

```
C:\Users\USER\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Futu
reWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` exp
licitly to suppress the warning
  warnings.warn(
C:\Users\USER\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Futu
reWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` exp
licitly to suppress the warning
  warnings.warn(
C:\Users\USER\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Futu
reWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` exp
licitly to suppress the warning
  warnings.warn(
C:\Users\USER\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Futu
reWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` exp
licitly to suppress the warning
  warnings.warn(
C:\Users\USER\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Futu
reWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` exp
licitly to suppress the warning
  warnings.warn(
C:\Users\USER\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Futu
reWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` exp
licitly to suppress the warning
  warnings.warn(
C:\Users\USER\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Futu
reWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` exp
licitly to suppress the warning
  warnings.warn(
C:\Users\USER\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Futu
reWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` exp
licitly to suppress the warning
  warnings.warn(
[27.81750759504307, 14.87203295827117, 10.252751496105196, 8.484357233864698, 7.035500433198194, 6.064715289
953034, 5.117927753802227, 4.44301570025843, 4.039614257832381]
```

```
C:\Users\USER\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\cluster\_kmeans.py:870: Futu
reWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` exp
licitly to suppress the warning
  warnings.warn(
```

```
Out[21]: Text(0, 0.5, 'Sum of Squared Error')
```



CONCLUSION:

for the given dataset we can use multiple models,for that models we get different types of accuracies but thataccuracies is not good so,that's why we will take it as a clustering and done with K-Means clustering