In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn import metrics
from sklearn.preprocessing import StandardScaler,LabelEncoder
from sklearn.datasets import make_classification
from sklearn.metrics import accuracy_score
from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report
from sklearn.metrics import f1_score , recall_score , precision_score
from sklearn.metrics import plot_confusion_matrix
```

In [2]:
```
Data = pd.read_csv("P1_Data.csv") # Upload the data
```

In [3]:
```
Data
```

Out[3]:

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	...	F13	F14	F15	F16	F17	F18	F19	F20	F21	Class
0	1.6430	0	-4894.24	-13.0281	-4.793400	0	5.12700	-17.1100	-63.340	3.61690	...	5.783440	-11315.46	22912.53	-0.4	103811.34	5.4380	1747.920	-4879.68	-41.58	False
1	0.5310	0	-5085.44	-16.2210	-3.991776	0	4.62560	-4.5800	-10.314	3.64880	...	8.180000	-12852.96	25696.44	-0.4	103884.02	5.0960	1496.080	-4186.38	-45.96	True
2	0.2640	0	-7021.44	-11.7591	-6.161700	0	4.36280	-14.7118	-6.806	3.62830	...	5.760312	-11012.16	20232.84	-1.4	103987.08	2.3652	1523.412	-4067.28	NaN	False
3	0.3196	1	-4648.76	-11.8110	-4.217700	0	8.93800	-7.5360	-4.670	3.01503	...	6.437100	-10297.86	23592.84	-1.4	103842.08	4.4080	1506.810	1352.52	NaN	True
4	4.0800	0	-4877.20	-11.2635	-8.061000	1	6.28000	-14.5805	-45.920	3.60030	...	6.393200	-11527.38	24778.74	-1.4	103842.48	3.1334	1581.790	-5095.88	-45.93	True
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
995	0.6828	1	-5766.04	-11.8536	-4.866600	1	7.93800	-11.1720	-8.014	3.27040	...	7.489000	-11922.06	23569.44	-1.4	103930.52	2.8358	1551.190	-5559.68	NaN	False
996	1.2240	1	-4424.64	-16.6770	-8.313000	1	4.91960	-15.1500	-12.676	3.81610	...	7.069000	-11328.69	24196.14	-0.4	103922.40	4.0364	1519.940	-4089.48	NaN	False
997	0.9912	1	-5566.64	-10.9698	-8.364000	0	3.99842	-15.4260	-17.442	3.73230	...	5.875600	-12229.26	18449.64	-1.4	103872.12	3.8368	1509.360	-3772.28	NaN	True
998	0.6697	1	-4630.96	-11.4516	-4.970700	0	8.61600	-19.5220	-1.698	3.22630	...	5.761497	-10846.56	23102.40	-1.4	103837.70	4.4460	1549.200	-3947.68	-40.11	False
999	0.8394	1	-5488.44	-11.9115	-5.107200	0	7.04600	-12.8750	-13.292	3.30530	...	6.069900	-11860.29	23621.04	-0.4	103885.30	3.4320	1522.223	-4645.08	NaN	True

1000 rows × 22 columns

In [4]:
```
del Data['F21'] # Delete the column F21
```

In [5]:
```
X = Data.drop('Class', axis = 1) # Excluding target variable
```

In [6]:
```
y = Data['Class'] # target variable
```

In [7]:
```
# Split the dataset into train and test subsets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.3, random_state = 0)
# To train the model, we use X_train as the features and y_train as true labels.
# To test the model, we use X_test as the features and y_test is used to validate the predicted labels
# Test size is the percentage of data that should be used for testing/validation.
```

In [8]:
```
print("Number transactions X_train dataset: ", X_train.shape)
print("Number transactions y_train dataset: ", y_train.shape)
print("Number transactions X_test dataset: ", X_test.shape)
print("Number transactions y_test dataset: ", y_test.shape)
```

```
Number transactions X_train dataset:  (700, 20)
Number transactions y_train dataset:  (700,)
Number transactions X_test dataset:  (300, 20)
Number transactions y_test dataset:  (300,)
```

Decision Tree Classifier

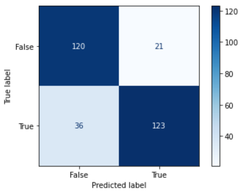
In [9]:
```
# create a classifier: Decision Tree Classifier
dtree=DecisionTreeClassifier()
dtree.fit(X_train,y_train) # Fit the data into model
y_predict = dtree.predict(X_test) # Predict the value of dataset on the test subset
print(confusion_matrix(y_test,y_predict))
print(classification_report(y_test,y_predict))
print(accuracy_score(y_test, y_predict))
plot_confusion_matrix(dtree,X_test,y_test, cmap = plt.cm.Blues)
plt.show() # Plot the confusion matrix
```

```
[[120  21]
 [ 36 123]]
              precision    recall  f1-score   support

       False       0.77      0.85      0.81       141
        True       0.85      0.77      0.81       159

    accuracy                           0.81       300
   macro avg       0.81      0.81      0.81       300
weighted avg       0.81      0.81      0.81       300

0.81
```



Random Forest Classifier

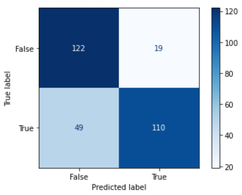
In [10]:
```
# create a classifier: Random Forest Classifier
from sklearn.ensemble import RandomForestClassifier
clf = RandomForestClassifier(n_estimators=20)
clf = clf.fit(X_train, y_train)
y_predict = clf.predict(X_test)
print(confusion_matrix(y_test,y_predict))
print(classification_report(y_test,y_predict))
print(accuracy_score(y_test, y_predict))
plot_confusion_matrix(clf,X_test,y_test, cmap = plt.cm.Blues)
plt.show()
```

```
[[122  19]
 [ 49 110]]
              precision    recall  f1-score   support

       False       0.71      0.87      0.78       141
        True       0.85      0.69      0.76       159

    accuracy                           0.77       300
   macro avg       0.78      0.78      0.77       300
weighted avg       0.79      0.77      0.77       300

0.7733333333333333
```



Gradient Boosting Classifier

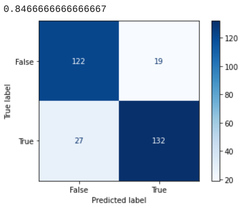
In [11]:
```
# create a classifier: Gradient Boosting Classifier
from sklearn.ensemble import GradientBoostingClassifier
GRA=GradientBoostingClassifier(n_estimators=200, random_state= 1, learning_rate=0.01)
GRA.fit(X_train,y_train)
y_predict = GRA.predict(X_test)
print(confusion_matrix(y_test,y_predict))
print(classification_report(y_test,y_predict))
print(accuracy_score(y_test, y_predict))
plot_confusion_matrix(GRA,X_test,y_test, cmap = plt.cm.Blues)
plt.show()
```

```
[[122  19]
 [ 27 132]]
              precision    recall  f1-score   support

       False       0.82      0.87      0.84       141
        True       0.87      0.83      0.85       159

    accuracy                           0.85       300
   macro avg       0.85      0.85      0.85       300
weighted avg       0.85      0.85      0.85       300

0.8466666666666667
```



In [12]:
```
# Gradient Boosting Classifier imparts the highest accuracy, i.e. 85%, along with recall 83% and 87%, precision 87% and 82%, F1-Score 85% and 84% f
# Random Boosting Classifier imparts the least accuracy, i.e. 77%, along with recall 70% and 85%, precision 84% and 72%, F1-Score 77% and 78% for t
```

In [ ]:
```
```