In [3]:
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns


df=pd.read_csv('Algerian_forest_fires_dataset.csv',header=1)
df.head()
```

Out[3]:

	day	month	year	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes
0	1	6	2012	29	57	18	0	65.7	3.4	7.6	1.3	3.4	0.5	not fire
1	2	6	2012	29	61	13	1.3	64.4	4.1	7.6	1	3.9	0.4	not fire
2	3	6	2012	26	82	22	13.1	47.1	2.5	7.1	0.3	2.7	0.1	not fire
3	4	6	2012	25	89	13	2.5	28.6	1.3	6.9	0	1.7	0	not fire
4	5	6	2012	27	77	16	0	64.8	3	14.2	1.2	3.9	0.5	not fire

In [4]:
```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 247 entries, 0 to 246
Data columns (total 14 columns):
 #   Column       Non-Null Count  Dtype 
---  ------       --------------  ----- 
 0   day          246 non-null    object
 1   month        245 non-null    object
 2   year         245 non-null    object
 3   Temperature  245 non-null    object
 4    RH          245 non-null    object
 5    Ws          245 non-null    object
 6   Rain         245 non-null    object
 7   FFMC         245 non-null    object
 8   DMC          245 non-null    object
 9   DC           245 non-null    object
 10  ISI          245 non-null    object
 11  BUI          245 non-null    object
 12  FWI          245 non-null    object
 13  Classes      244 non-null    object
dtypes: object(14)
memory usage: 27.1+ KB
```

In [62]:
```python
## CHECK MISSING VALUES

df[df.isnull().any(axis=1)] # checking if there any null value in any column
```

Out[62]:

day	month	year	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes	Region

In [63]:
```python
df.loc[:122,"Region"]=0
df.loc[122:,"Region"]=1
```

In [64]:
```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 243 entries, 0 to 242
Data columns (total 15 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   day          243 non-null    int32  
 1   month        243 non-null    int32  
 2   year         243 non-null    int32  
 3   Temperature  243 non-null    int32  
 4   RH           243 non-null    int32  
 5   Ws           243 non-null    int32  
 6   Rain         243 non-null    float64
 7   FFMC         243 non-null    float64
 8   DMC          243 non-null    float64
 9   DC           243 non-null    float64
 10  ISI          243 non-null    float64
 11  BUI          243 non-null    float64
 12  FWI          243 non-null    float64
 13  Classes      243 non-null    object 
 14  Region       243 non-null    int32  
dtypes: float64(7), int32(7), object(1)
memory usage: 22.0+ KB
```

In [11]:
```python
df[['Region']]=df[['Region']].astype(int)
```

In [12]:
```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 247 entries, 0 to 246
Data columns (total 15 columns):
 #   Column       Non-Null Count  Dtype 
---  ------       --------------  ----- 
 0   day          246 non-null    object
 1   month        245 non-null    object
 2   year         245 non-null    object
 3   Temperature  245 non-null    object
 4    RH          245 non-null    object
 5    Ws          245 non-null    object
 6   Rain         245 non-null    object
 7   FFMC         245 non-null    object
 8   DMC          245 non-null    object
 9   DC           245 non-null    object
 10  ISI          245 non-null    object
 11  BUI          245 non-null    object
 12  FWI          245 non-null    object
 13  Classes      244 non-null    object
 14  Region       247 non-null    int32 
dtypes: int32(1), object(14)
memory usage: 28.1+ KB
```

In [13]:
```python
df.head()
```

Out[13]:

	day	month	year	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes	Region
0	1	6	2012	29	57	18	0	65.7	3.4	7.6	1.3	3.4	0.5	not fire	0
1	2	6	2012	29	61	13	1.3	64.4	4.1	7.6	1	3.9	0.4	not fire	0
2	3	6	2012	26	82	22	13.1	47.1	2.5	7.1	0.3	2.7	0.1	not fire	0
3	4	6	2012	25	89	13	2.5	28.6	1.3	6.9	0	1.7	0	not fire	0
4	5	6	2012	27	77	16	0	64.8	3	14.2	1.2	3.9	0.5	not fire	0

In [14]:
```python
df.isnull().sum()
```

Out[14]:
```
day            1
month          2
year           2
Temperature    2
 RH            2
 Ws            2
Rain           2
FFMC           2
DMC            2
DC             2
ISI            2
BUI            2
FWI            2
Classes        3
Region         0
dtype: int64
```

In [15]:
```python
#remove null value
df=df.dropna().reset_index(drop=True)
```

In [16]:
```python
df.head()
```

Out[16]:

	day	month	year	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes	Region
0	1	6	2012	29	57	18	0	65.7	3.4	7.6	1.3	3.4	0.5	not fire	0
1	2	6	2012	29	61	13	1.3	64.4	4.1	7.6	1	3.9	0.4	not fire	0
2	3	6	2012	26	82	22	13.1	47.1	2.5	7.1	0.3	2.7	0.1	not fire	0
3	4	6	2012	25	89	13	2.5	28.6	1.3	6.9	0	1.7	0	not fire	0
4	5	6	2012	27	77	16	0	64.8	3	14.2	1.2	3.9	0.5	not fire	0

In [17]:
```python
df.isnull().sum()
```

Out[17]:
```
day            0
month          0
year           0
Temperature    0
 RH            0
 Ws            0
Rain           0
FFMC           0
DMC            0
DC             0
ISI            0
BUI            0
FWI            0
Classes        0
Region         0
dtype: int64
```

In [18]:
```python
df.iloc[[122]]
```

Out[18]:

	day	month	year	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes	Region
122	day	month	year	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes	1

In [19]:
```python
df=df.drop(122).reset_index(drop=True)
```

In [20]:
```python
df.iloc[[122]]
```

Out[20]:

	day	month	year	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes	Region
122	1	6	2012	32	71	12	0.7	57.1	2.5	8.2	0.6	2.8	0.2	not fire	1

In [21]:
```python
df.columns
```

Out[21]:
```
Index(['day', 'month', 'year', 'Temperature', ' RH', ' Ws', 'Rain ', 'FFMC',
       'DMC', 'DC', 'ISI', 'BUI', 'FWI', 'Classes  ', 'Region'],
      dtype='object')
```

In [22]:
```python
## fix spaces in column name
df.columns=df.columns.str.strip()
df.columns
```

Out[22]:
```
Index(['day', 'month', 'year', 'Temperature', 'RH', 'Ws', 'Rain', 'FFMC',
       'DMC', 'DC', 'ISI', 'BUI', 'FWI', 'Classes', 'Region'],
      dtype='object')
```

In [23]:
```python
 ##change the required column as integer data type
df[['month','day','year','Temperature','RH','Ws']]= df[['month','day','year','Temperature','RH','Ws']].astype(int)
```

In [24]:
```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 243 entries, 0 to 242
Data columns (total 15 columns):
 #   Column       Non-Null Count  Dtype 
---  ------       --------------  ----- 
 0   day          243 non-null    int32 
 1   month        243 non-null    int32 
 2   year         243 non-null    int32 
 3   Temperature  243 non-null    int32 
 4   RH           243 non-null    int32 
 5   Ws           243 non-null    int32 
 6   Rain         243 non-null    object
 7   FFMC         243 non-null    object
 8   DMC          243 non-null    object
 9   DC           243 non-null    object
 10  ISI          243 non-null    object
 11  BUI          243 non-null    object
 12  FWI          243 non-null    object
 13  Classes      243 non-null    object
 14  Region       243 non-null    int32 
dtypes: int32(7), object(8)
memory usage: 22.0+ KB
```

In [25]:
```python
## changing the other column to float datatype

objects=[feature for feature in df.columns if df[feature].dtype=='O']
```

In [26]:
```python
for i in objects:
    if i!='Classes':
        df[i]=df[i].astype(float)
```

In [27]:
```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 243 entries, 0 to 242
Data columns (total 15 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   day          243 non-null    int32  
 1   month        243 non-null    int32  
 2   year         243 non-null    int32  
 3   Temperature  243 non-null    int32  
 4   RH           243 non-null    int32  
 5   Ws           243 non-null    int32  
 6   Rain         243 non-null    float64
 7   FFMC         243 non-null    float64
 8   DMC          243 non-null    float64
 9   DC           243 non-null    float64
 10  ISI          243 non-null    float64
 11  BUI          243 non-null    float64
 12  FWI          243 non-null    float64
 13  Classes      243 non-null    object 
 14  Region       243 non-null    int32  
dtypes: float64(7), int32(7), object(1)
memory usage: 22.0+ KB
```

In [28]:
```python
df.describe()
```

Out[28]:

	day	month	year	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Region
count	243.000000	243.000000	243.0	243.000000	243.000000	243.000000	243.000000	243.000000	243.000000	243.000000	243.000000	243.000000	243.000000	243.000000
mean	15.761317	7.502058	2012.0	32.152263	62.041152	15.493827	0.762963	77.842387	14.680658	49.430864	4.742387	16.690535	7.035391	0.497942
std	8.842552	1.114793	0.0	3.628039	14.828160	2.811385	2.003207	14.349641	12.393040	47.665606	4.154234	14.228421	7.440568	0.501028
min	1.000000	6.000000	2012.0	22.000000	21.000000	6.000000	0.000000	28.600000	0.700000	6.900000	0.000000	1.100000	0.000000	0.000000
25%	8.000000	7.000000	2012.0	30.000000	52.500000	14.000000	0.000000	71.850000	5.800000	12.350000	1.400000	6.000000	0.700000	0.000000
50%	16.000000	8.000000	2012.0	32.000000	63.000000	15.000000	0.000000	83.300000	11.300000	33.100000	3.500000	12.400000	4.200000	0.000000
75%	23.000000	8.000000	2012.0	35.000000	73.500000	17.000000	0.500000	88.300000	20.800000	69.100000	7.250000	22.650000	11.450000	1.000000
max	31.000000	9.000000	2012.0	42.000000	90.000000	29.000000	16.800000	96.000000	65.900000	220.400000	19.000000	68.000000	31.100000	1.000000

In [29]:
```python
#let save the cleaned dataset
df.to_csv("Algerian_forest_fires_cleaned_dataset.csv",index=False)
```

In [30]:
```python
df_copy=df.drop(['day','month','year'],axis=1)
```

In [31]:
```python
df_copy.head()
```

Out[31]:

	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes	Region
0	29	57	18	0.0	65.7	3.4	7.6	1.3	3.4	0.5	not fire	0
1	29	61	13	1.3	64.4	4.1	7.6	1.0	3.9	0.4	not fire	0
2	26	82	22	13.1	47.1	2.5	7.1	0.3	2.7	0.1	not fire	0
3	25	89	13	2.5	28.6	1.3	6.9	0.0	1.7	0.0	not fire	0
4	27	77	16	0.0	64.8	3.0	14.2	1.2	3.9	0.5	not fire	0

In [32]:
```python
##categories in classes
df_copy['Classes'].value_counts()
```

Out[32]:
```
Classes
fire             131
not fire         101
fire               4
fire               2
not fire           2
not fire           1
not fire           1
not fire           1
Name: count, dtype: int64
```

In [33]:
```python
## encoding of the categories in classes
df_copy['Classes']=np.where(df_copy['Classes'].str.contains('not fire'),0,1)
```

In [34]:
```python
df_copy.head()
```

Out[34]:

	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes	Region
0	29	57	18	0.0	65.7	3.4	7.6	1.3	3.4	0.5	0	0
1	29	61	13	1.3	64.4	4.1	7.6	1.0	3.9	0.4	0	0
2	26	82	22	13.1	47.1	2.5	7.1	0.3	2.7	0.1	0	0
3	25	89	13	2.5	28.6	1.3	6.9	0.0	1.7	0.0	0	0
4	27	77	16	0.0	64.8	3.0	14.2	1.2	3.9	0.5	0	0

In [35]:
```python
 df_copy.tail()
```

Out[35]:

	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes	Region
238	30	65	14	0.0	85.4	16.0	44.5	4.5	16.9	6.5	1	1
239	28	87	15	4.4	41.1	6.5	8.0	0.1	6.2	0.0	0	1
240	27	87	29	0.5	45.9	3.5	7.9	0.4	3.4	0.2	0	1
241	24	54	18	0.1	79.7	4.3	15.2	1.7	5.1	0.7	0	1
242	24	64	15	0.2	67.3	3.8	16.5	1.2	4.8	0.5	0	1

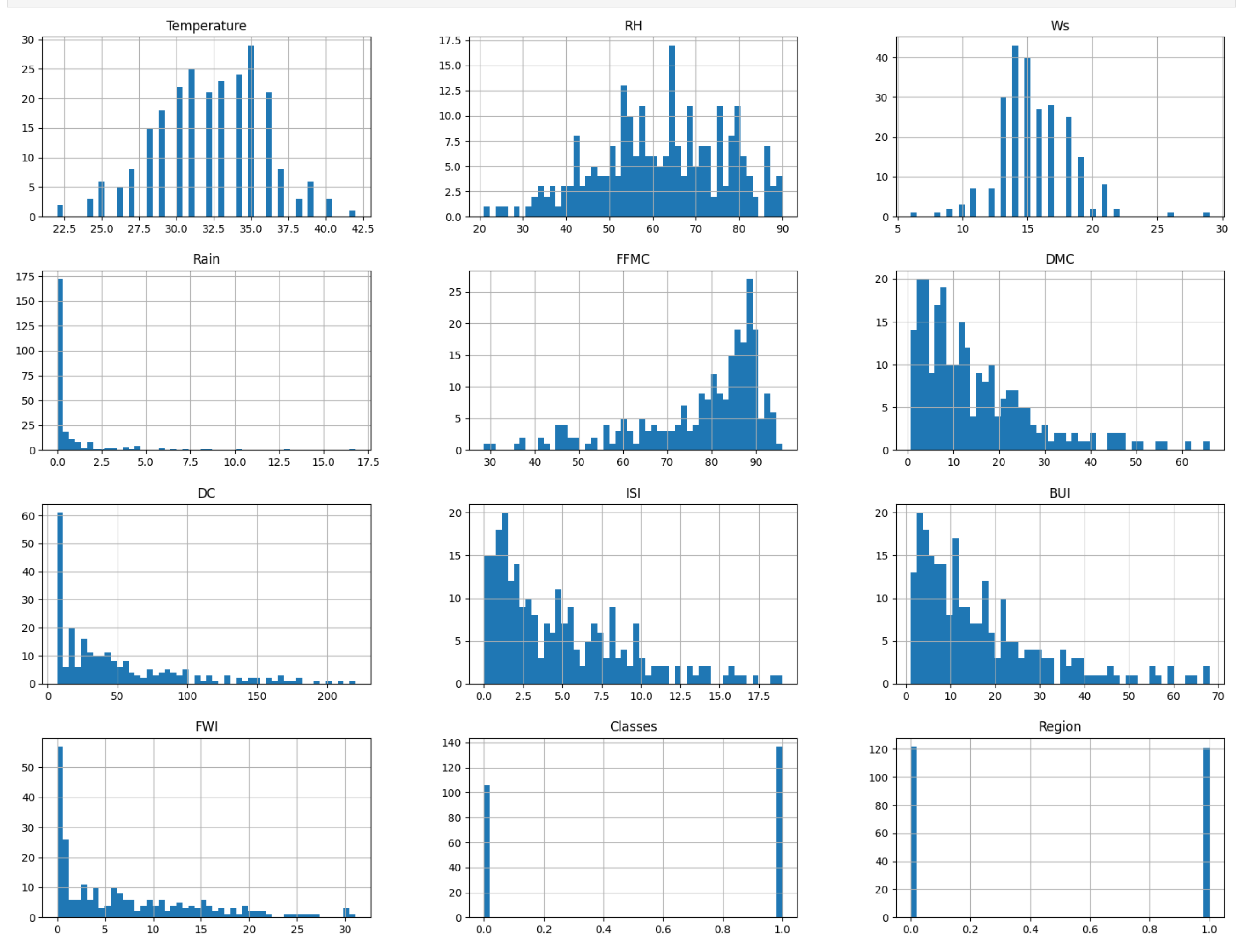
In [36]:
```python
df_copy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 243 entries, 0 to 242
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   Temperature  243 non-null    int32  
 1   RH           243 non-null    int32  
 2   Ws           243 non-null    int32  
 3   Rain         243 non-null    float64
 4   FFMC         243 non-null    float64
 5   DMC          243 non-null    float64
 6   DC           243 non-null    float64
 7   ISI          243 non-null    float64
 8   BUI          243 non-null    float64
 9   FWI          243 non-null    float64
 10  Classes      243 non-null    int32  
 11  Region       243 non-null    int32  
dtypes: float64(7), int32(5)
memory usage: 18.2 KB
```

In [37]:
```python
##categories in classes
df_copy['Classes'].value_counts()
```

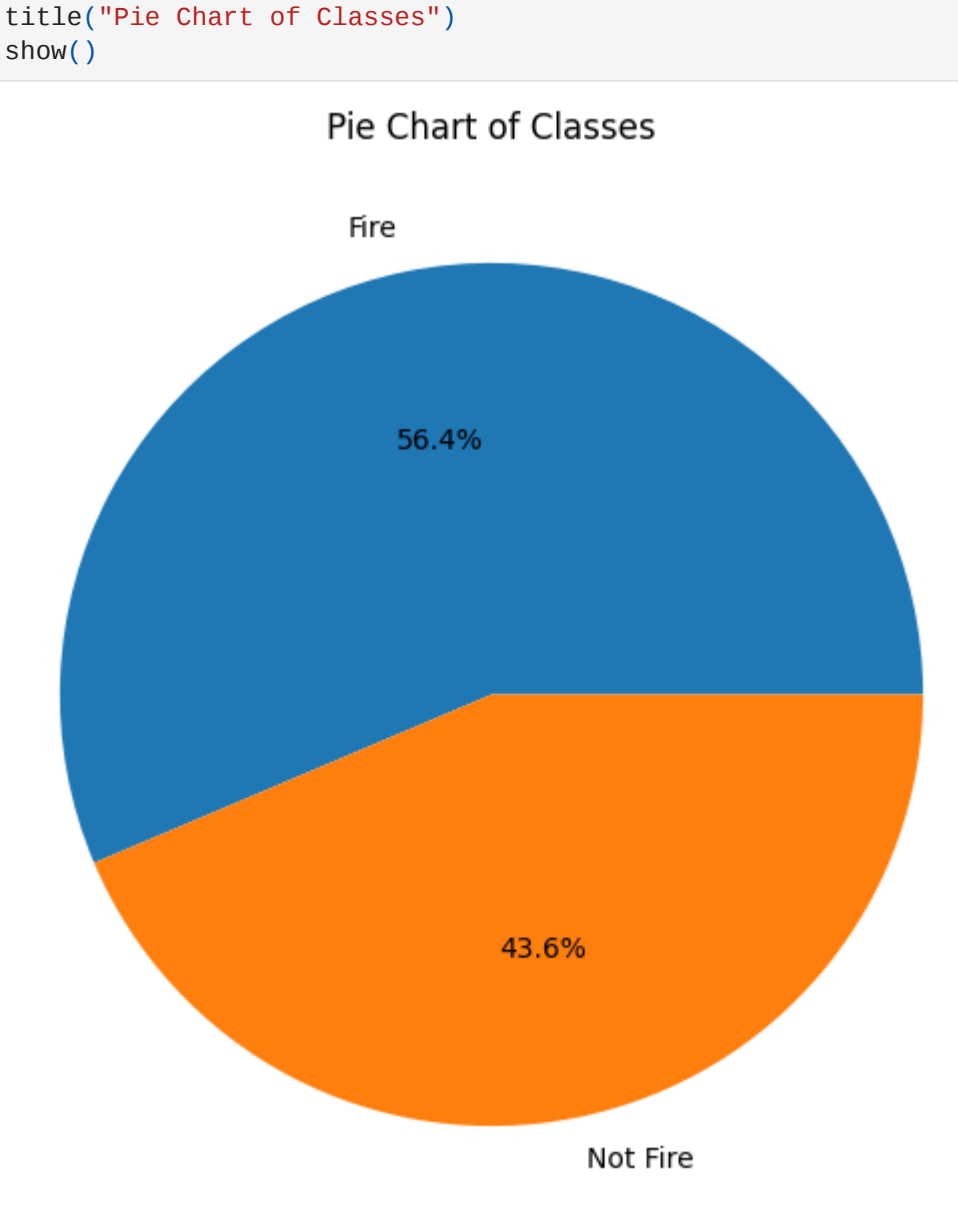
Out[37]:
```
Classes
1    137
0    106
Name: count, dtype: int64
```

In [39]:
```python
#sns.set_style('seaborn')
#plt.style.use('seaborn')
df_copy.hist(bins=50,figsize=(20,15))
plt.show()
```



In [40]:
```python
percentage=df_copy["Classes"].value_counts(normalize=True)*100
```

In [41]:
```python
## plotting pie chart
classlabels=['Fire','Not Fire']
plt.figure(figsize=(12,7))
plt.pie(percentage, labels=classlabels,autopct='%1.1f%%')
plt.title("Pie Chart of Classes")
plt.show()
```



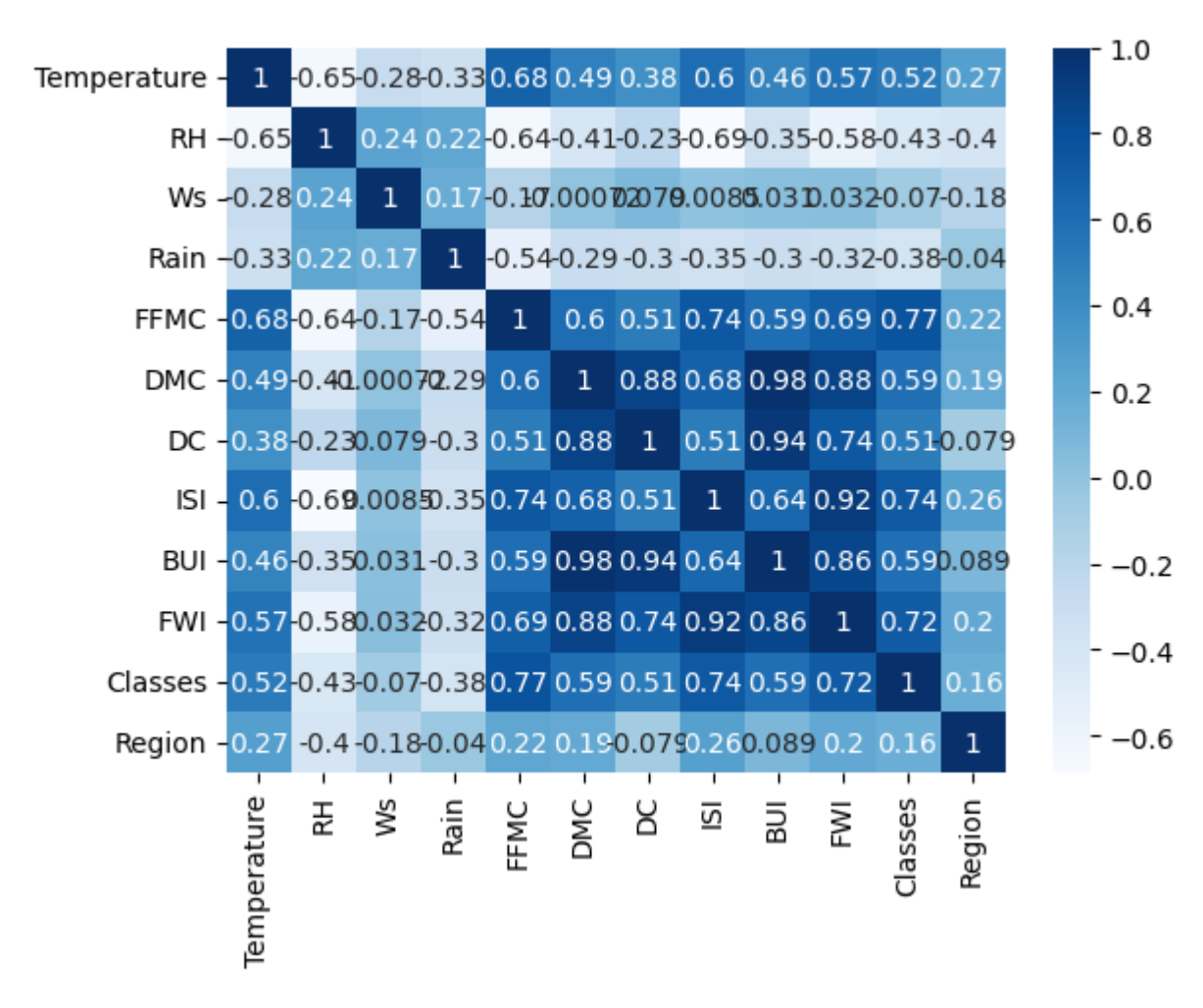
In [42]:
```python
## correlation
df_copy.corr()
```

Out[42]:

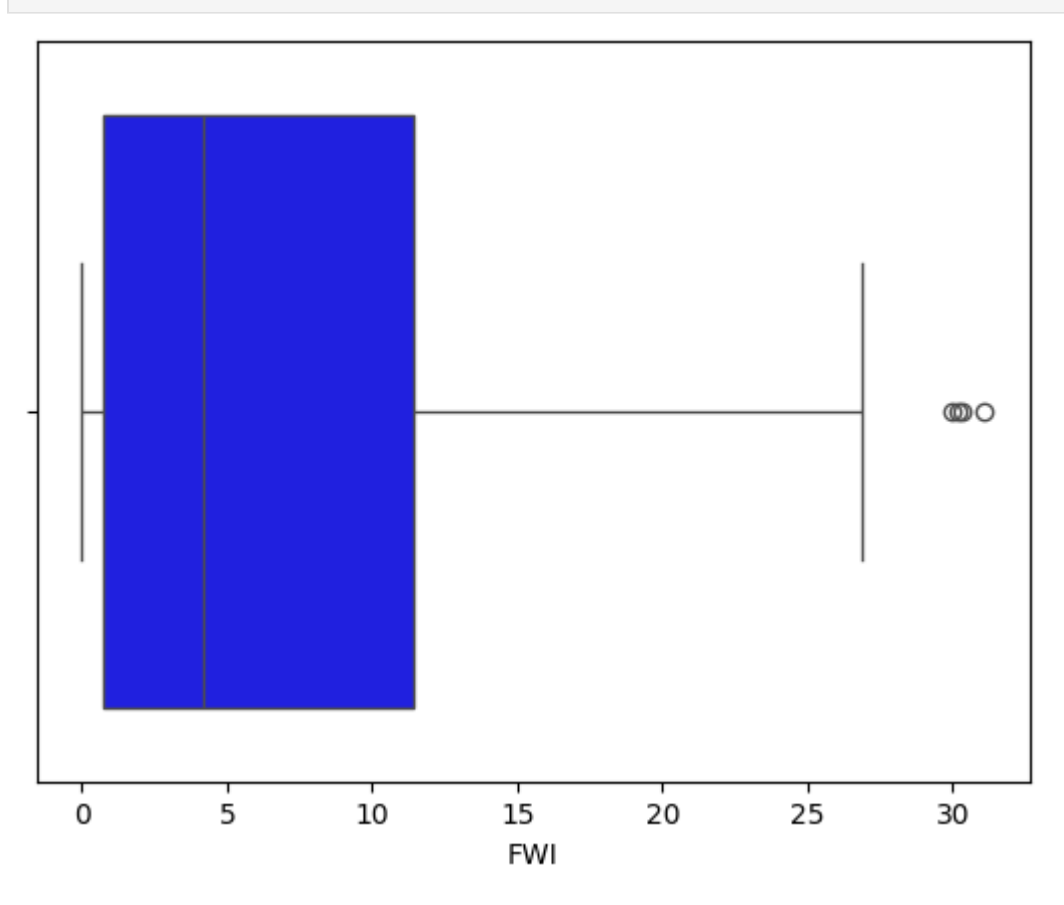
	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes	Region
Temperature	1.000000	-0.651400	-0.284510	-0.326492	0.676568	0.485687	0.376284	0.603871	0.459789	0.566670	0.516015	0.269555
RH	-0.651400	1.000000	0.244048	0.222356	-0.644873	-0.408519	-0.226941	-0.686667	-0.353841	-0.580957	-0.432161	-0.402682
Ws	-0.284510	0.244048	1.000000	0.171506	-0.166548	-0.000721	0.079135	0.008532	0.031438	0.032368	-0.069964	-0.181160
Rain	-0.326492	0.222356	0.171506	1.000000	-0.543906	-0.288773	-0.298023	-0.347484	-0.299852	-0.324422	-0.379097	-0.040013
FFMC	0.676568	-0.644873	-0.166548	-0.543906	1.000000	0.603608	0.507397	0.740007	0.592011	0.691132	0.769492	0.222241
DMC	0.485687	-0.408519	-0.000721	-0.288773	0.603608	1.000000	0.875925	0.680454	0.982248	0.875864	0.585658	0.192089
DC	0.376284	-0.226941	0.079135	-0.298023	0.507397	0.875925	1.000000	0.508643	0.941988	0.739521	0.511123	-0.078734
ISI	0.603871	-0.686667	0.008532	-0.347484	0.740007	0.680454	0.508643	1.000000	0.644093	0.922895	0.735197	0.263197
BUI	0.459789	-0.353841	0.031438	-0.299852	0.592011	0.982248	0.941988	0.644093	1.000000	0.857973	0.586639	0.089408
FWI	0.566670	-0.580957	0.032368	-0.324422	0.691132	0.875864	0.739521	0.922895	0.857973	1.000000	0.719216	0.197102
Classes	0.516015	-0.432161	-0.069964	-0.379097	0.769492	0.585658	0.511123	0.735197	0.586639	0.719216	1.000000	0.162347
Region	0.269555	-0.402682	-0.181160	-0.040013	0.222241	0.192089	-0.078734	0.263197	0.089408	0.197102	0.162347	1.000000

In [60]:
```python
sns.heatmap(df_copy.corr(),annot=True,cmap="Blues")
```

Out[60]:
```
<Axes: >
```



In [61]:
```python
## box plots
ax=sns.boxplot(x=df_copy['FWI'],color='blue')
ax.set_xlabel('FWI')
plt.show()
```



In [45]:
```python
df.head()
```

Out[45]:

	day	month	year	Temperature	RH	Ws	Rain	FFMC	DMC	DC	ISI	BUI	FWI	Classes	Region
0	1	6	2012	29	57	18	0.0	65.7	3.4	7.6	1.3	3.4	0.5	not fire	0
1	2	6	2012	29	61	13	1.3	64.4	4.1	7.6	1.0	3.9	0.4	not fire	0
2	3	6	2012	26	82	22	13.1	47.1	2.5	7.1	0.3	2.7	0.1	not fire	0
3	4	6	2012	25	89	13	2.5	28.6	1.3	6.9	0.0	1.7	0.0	not fire	0
4	5	6	2012	27	77	16	0.0	64.8	3.0	14.2	1.2	3.9	0.5	not fire	0

In [ ]: