EXPLORATARY DATA ANALYSIS ON UDEMY COURSES

In [159]:

```
pwd
```

Out[159]:

```
'C:\\Users\\Administrator'
```

In [160]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

LOAD DATA

In [162]:

```
df=pd.read_csv("C:/Users/Administrator/Desktop/Udemy_Courses.csv")
```

In [163]:

```
df.head()
```

Out[163]:

	course_id	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	level	content_duration	published_timestamp	subject
0	288942	1 Piano Hand Coordination: Play 10th Ballad in...	True	35.0	3137.0	18	68	All Levels	1.5 hours	2014-09-18T05:07:05Z	Musical Instruments
1	1170074	10 Hand Coordination - Transfer Chord Ballad 9...	True	75.0	1593.0	1	41	Intermediate Level	1 hour	2017-04-12T19:06:34Z	Musical Instruments
2	1193886	12 Hand Coordination: Let your Hands dance wit...	True	75.0	482.0	1	47	Intermediate Level	1.5 hours	2017-04-26T18:34:57Z	Musical Instruments
3	1116700	4 Piano Hand Coordination: Fun Piano Runs in 2...	True	75.0	850.0	3	43	Intermediate Level	1 hour	2017-02-21T23:48:18Z	Musical Instruments
4	1120410	5 Piano Hand Coordination: Piano Runs in 2 B...	True	75.0	940.0	3	32	Intermediate Level	37 mins	2017-02-21T23:44:49Z	Musical Instruments

DATA CLEANING

REPLACING NULL VALUES

In [166]:

```
df.isnull().sum()
```

Out[166]:

```
course_id               0
course_title            0
is_paid                 0
price                  31
num_subscribers        24
num_reviews             0
num_lectures            0
```

```
level                   0
content_duration        0
published_timestamp     0
subject                 0
dtype: int64
```

In [167]:

```
mean_value=df['price'].mean()
```

In [168]:

```
df['price'].fillna(mean_value, inplace=True)
```

In [169]:

```
df.isnull().sum()
```

Out[169]:

```
course_id               0
course_title            0
is_paid                 0
price                   0
num_subscribers        24
num_reviews             0
num_lectures            0
level                   0
content_duration        0
published_timestamp     0
subject                 0
dtype: int64
```

In [170]:

```
mean_value_subs=df['num_subscribers'].mean()
```

In [171]:

```
mean_value_subs
```

Out[171]:

```
3202.8810825587752
```

In [172]:

```
df['num_subscribers'].fillna(mean_value_subs, inplace=True)
```

In [173]:

```
df.isnull().sum()
```

Out[173]:

```
course_id              0
course_title           0
is_paid                0
price                  0
num_subscribers        0
num_reviews            0
num_lectures           0
level                  0
content_duration       0
published_timestamp    0
subject                0
dtype: int64
```

OUTLIER DETECTING

In [175]:

```
df.describe()
```

Out[175]:

	course_id	price	num_subscribers	num_reviews	num_lectures
count	3.682000e+03	3682.000000	3682.000000	3682.000000	3682.000000
mean	6.766121e+05	66.087373	3202.881083	156.093156	40.065182
std	3.436355e+05	60.722319	9492.532432	934.957204	50.373299

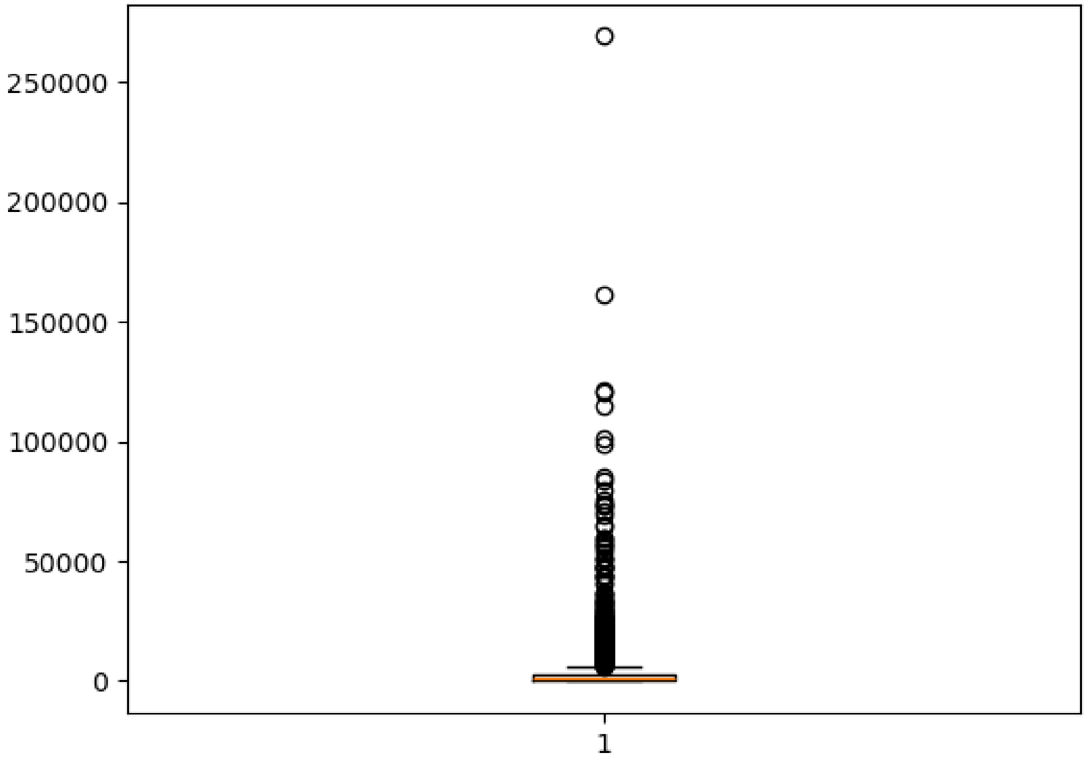
	course_id	price	num_subscribers	num_reviews	num_lectures
min	8.324000e+03	0.000000	0.000000	0.000000	0.000000
25%	4.078430e+05	20.000000	113.250000	4.000000	15.000000
50%	6.885580e+05	45.000000	935.000000	18.000000	25.000000
75%	9.617515e+05	95.000000	2609.250000	67.000000	45.000000
max	1.282064e+06	200.000000	268923.000000	27445.000000	779.000000

In [176]:

```
plt.boxplot(df['num_subscribers'])
```

Out[176]:

```
{'whiskers': [<matplotlib.lines.Line2D at 0x21ebe1c4fb0>,
  <matplotlib.lines.Line2D at 0x21ebe1c7080>],
 'caps': [<matplotlib.lines.Line2D at 0x21ebe1c4b90>,
  <matplotlib.lines.Line2D at 0x21ebe1c4530>],
 'boxes': [<matplotlib.lines.Line2D at 0x21ebe1cc7d0>],
 'medians': [<matplotlib.lines.Line2D at 0x21ebe1c6090>],
 'fliers': [<matplotlib.lines.Line2D at 0x21ebe1c9910>],
 'means': []}
```



In [212]:

```
Q1 = df['num_subscribers'].quantile(0.25)
Q3 = df['num_subscribers'].quantile(0.75)
IQR = Q3 - Q1

Lower_bound = Q1 - 1.5 * IQR
Upper_bound = Q3 + 1.5 * IQR

df['outliers'] =(df['num_subscribers'] < Lower_bound) | (df['num_subscribers'] > Upper_bound)


print(F"Q1:{Q1},Q3:{Q3},IQR:{IQR}")
print(F"Lower_bound : {Lower_bound},Upper_bound : {Upper_bound}")
```

```
Outliers = df[df['outliers']==True]
Q1:56.0,Q3:1375.5,IQR:1319.5
Lower_bound : -1923.25,Upper_bound : 3354.75
```

In [216]:

```
 df_cleaned = df.drop(Outliers.index)
```

In [179]:

```
df_cleaned.head()
```

Out[179]:

	course_id	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	level	content_duration	published_timestamp	subject
0	288942	1 Piano Hand Coordination: Play 10th Ballad in...	True	35.0	3137.0	18	68	All Levels	1.5 hours	2014-09-18T05:07:05Z	Musical Instruments
1	1170074	10 Hand Coordination - Transfer Chord Ballad 9...	True	75.0	1593.0	1	41	Intermediate Level	1 hour	2017-04-12T19:06:34Z	Musical Instruments
2	1193886	12 Hand Coordination: Let your Hands dance wit...	True	75.0	482.0	1	47	Intermediate Level	1.5 hours	2017-04-26T18:34:57Z	Musical Instruments
3	1116700	4 Piano Hand Coordination: Fun Piano Runs in 2...	True	75.0	850.0	3	43	Intermediate Level	1 hour	2017-02-21T23:48:18Z	Musical Instruments
4	1120410	5 Piano Hand Coordination: Piano Runs in 2 B...	True	75.0	940.0	3	32	Intermediate Level	37 mins	2017-02-21T23:44:49Z	Musical Instruments

In [218]:

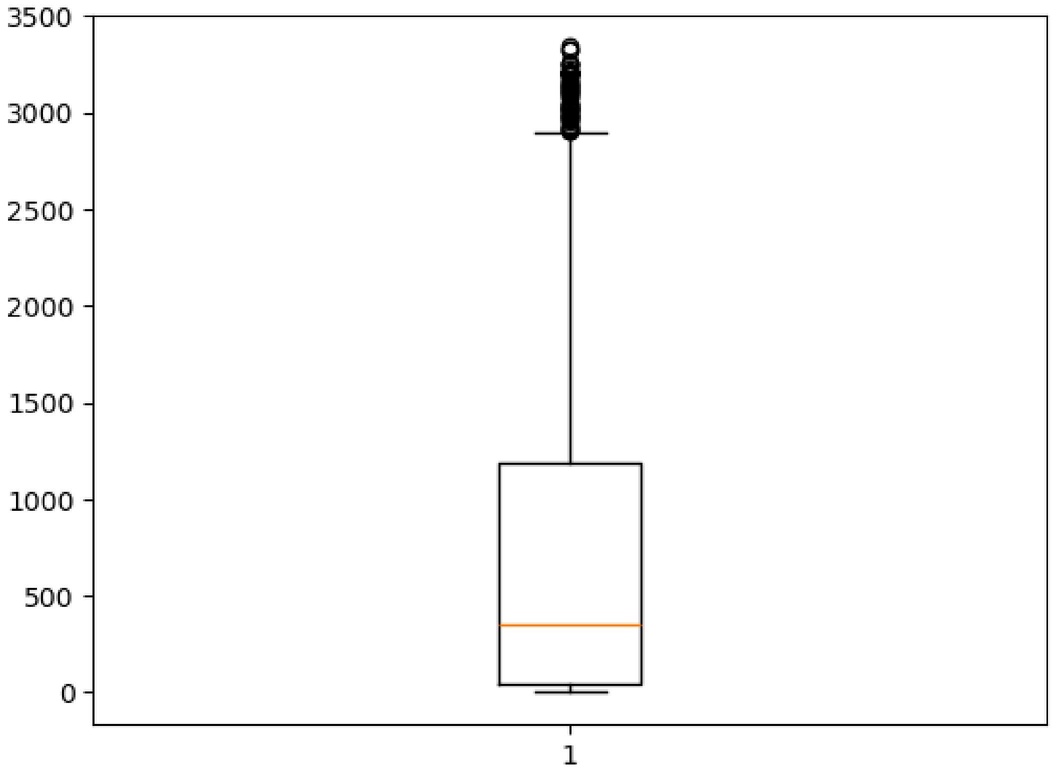
```
df=df_cleaned
```

In [220]:

```
plt.boxplot(df['num_subscribers'])
```

Out[220]:

```
{'whiskers': [<matplotlib.lines.Line2D at 0x21ebe5c2ae0>,
  <matplotlib.lines.Line2D at 0x21ebe5c2510>],
 'caps': [<matplotlib.lines.Line2D at 0x21ebe5c3110>,
  <matplotlib.lines.Line2D at 0x21ebe5c1e80>],
 'boxes': [<matplotlib.lines.Line2D at 0x21ebe5c12e0>],
 'medians': [<matplotlib.lines.Line2D at 0x21ebe5c2f90>],
 'fliers': [<matplotlib.lines.Line2D at 0x21ebe5c0710>],
 'means': []}
```

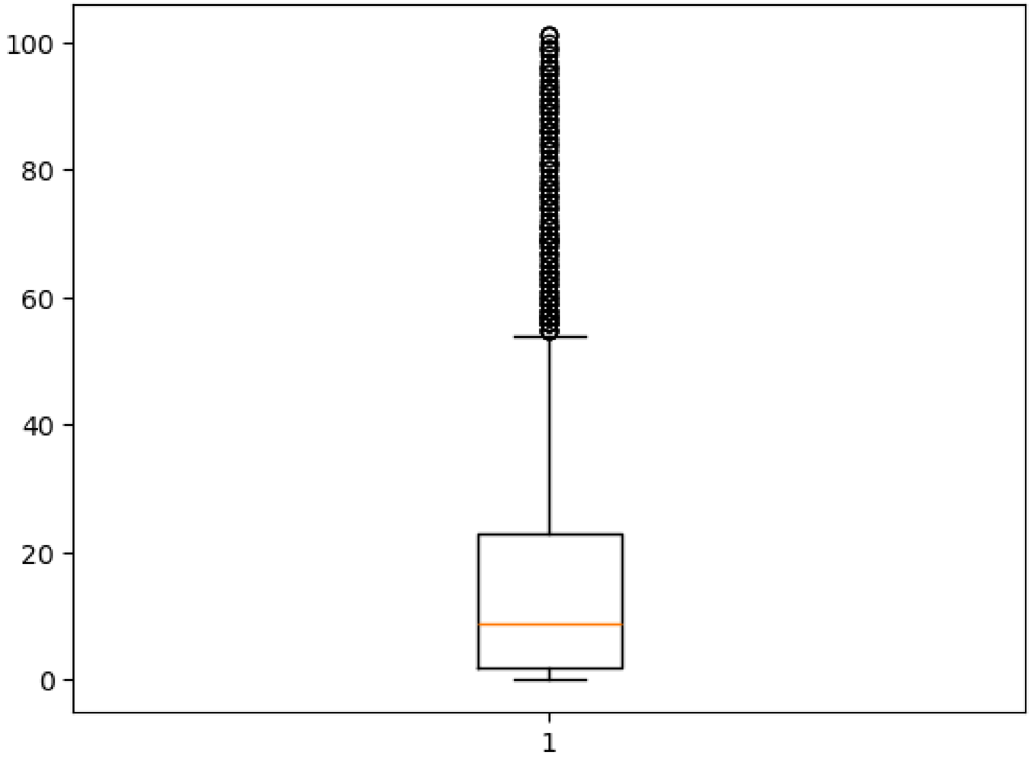


In [222]:

```
plt.boxplot(df['num_reviews'])
```

Out[222]:

```
{'whiskers': [<matplotlib.lines.Line2D at 0x21ebe752660>,
  <matplotlib.lines.Line2D at 0x21ebe752930>],
 'caps': [<matplotlib.lines.Line2D at 0x21ebe752c00>,
  <matplotlib.lines.Line2D at 0x21ebe752ed0>],
 'boxes': [<matplotlib.lines.Line2D at 0x21ebe1cd6d0>],
 'medians': [<matplotlib.lines.Line2D at 0x21ebe7530b0>],
 'fliers': [<matplotlib.lines.Line2D at 0x21ebe753380>],
 'means': []}
```



In [224]:

```
Q1 = df['num_reviews'].quantile(0.25)
Q3 = df['num_reviews'].quantile(0.75)
IQR = Q3 - Q1

Lower_bound = Q1 - 1.5 * IQR
Upper_bound = Q3 + 1.5 * IQR

df['outliers'] =(df['num_reviews'] < Lower_bound) | (df['num_reviews'] > Upper_bound)


print(F"Q1:{Q1},Q3:{Q3},IQR:{IQR}")
print(F"Lower_bound : {Lower_bound},Upper_bound : {Upper_bound}")

Outliers = df[df['outliers']==True]
#print(F"\n Outliers:\n{Outliers}")
```

```
Q1:2.0,Q3:23.0,IQR:21.0
Lower_bound : -29.5,Upper_bound : 54.5
```

In [226]:

```
 df_cleaned = df.drop(Outliers.index)
```

In [228]:

```
df_cleaned.head()
```

Out[228]:

	course_id	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	level	content_duration	published_timestamp	subject
0	288942	1 Piano Hand Coordination: Play 10th Ballad in...	True	35.0	3137.0	18	68	All Levels	1.5 hours	2014-09-18T05:07:05Z	Musical Instruments
1	1170074	10 Hand Coordination - Transfer Chord Ballad	True	75.0	1593.0	1	41	Intermediate Level	1 hour	2017-04-12T19:06:34Z	Musical Instruments

	course_id	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	level	content_duration	published_timestamp	subject
		9...									
2	1193886	12 Hand Coordination: Let your Hands dance wit...	True	75.0	482.0	1	47	Intermediate Level	1.5 hours	2017-04-26T18:34:57Z	Musical Instruments
3	1116700	4 Piano Hand Coordination: Fun Piano Runs in 2...	True	75.0	850.0	3	43	Intermediate Level	1 hour	2017-02-21T23:48:18Z	Musical Instruments
4	1120410	5 Piano Hand Coordination: Piano Runs in 2 B...	True	75.0	940.0	3	32	Intermediate Level	37 mins	2017-02-21T23:44:49Z	Musical Instruments

In [230]:

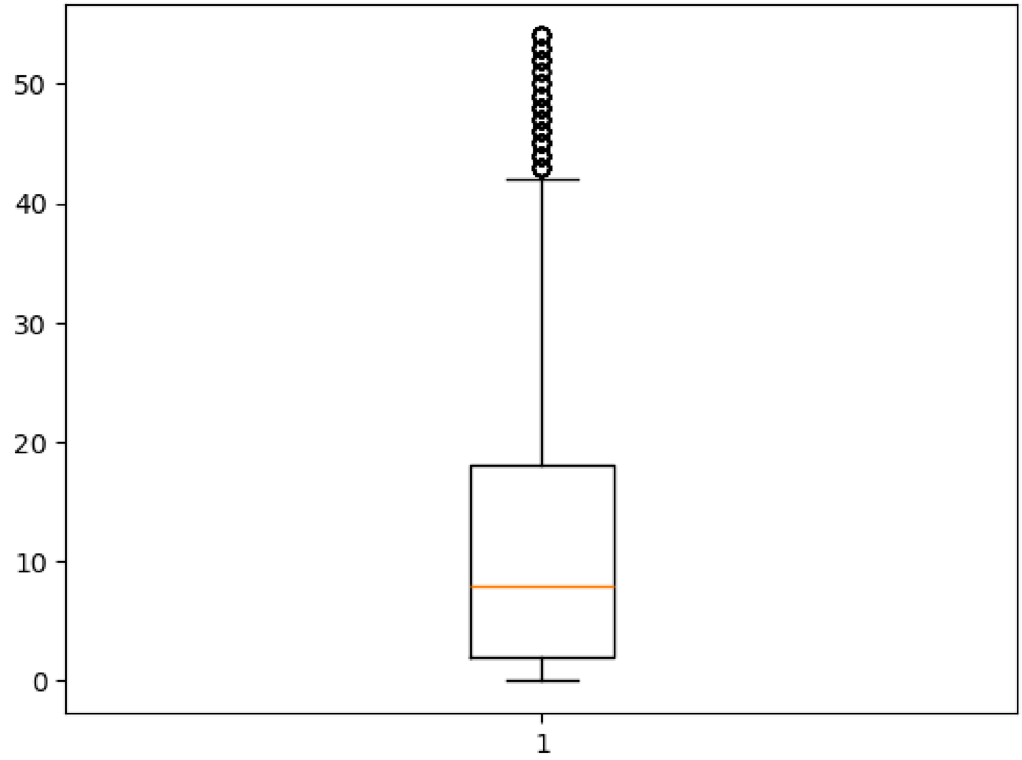
```
df=df_cleaned
```

In [232]:

```
plt.boxplot(df['num_reviews'])
```

Out[232]:

```
{'whiskers': [<matplotlib.lines.Line2D at 0x21ebea081d0>,
  <matplotlib.lines.Line2D at 0x21ebea084d0>],
 'caps': [<matplotlib.lines.Line2D at 0x21ebea087d0>,
  <matplotlib.lines.Line2D at 0x21ebea08aa0>],
 'boxes': [<matplotlib.lines.Line2D at 0x21ebe787e60>],
 'medians': [<matplotlib.lines.Line2D at 0x21ebea08c80>],
 'fliers': [<matplotlib.lines.Line2D at 0x21ebea08f50>],
 'means': []}
```



In [188]:

```
df.describe()
```

Out[188]:

	course_id	price	num_subscribers	num_reviews	num_lectures

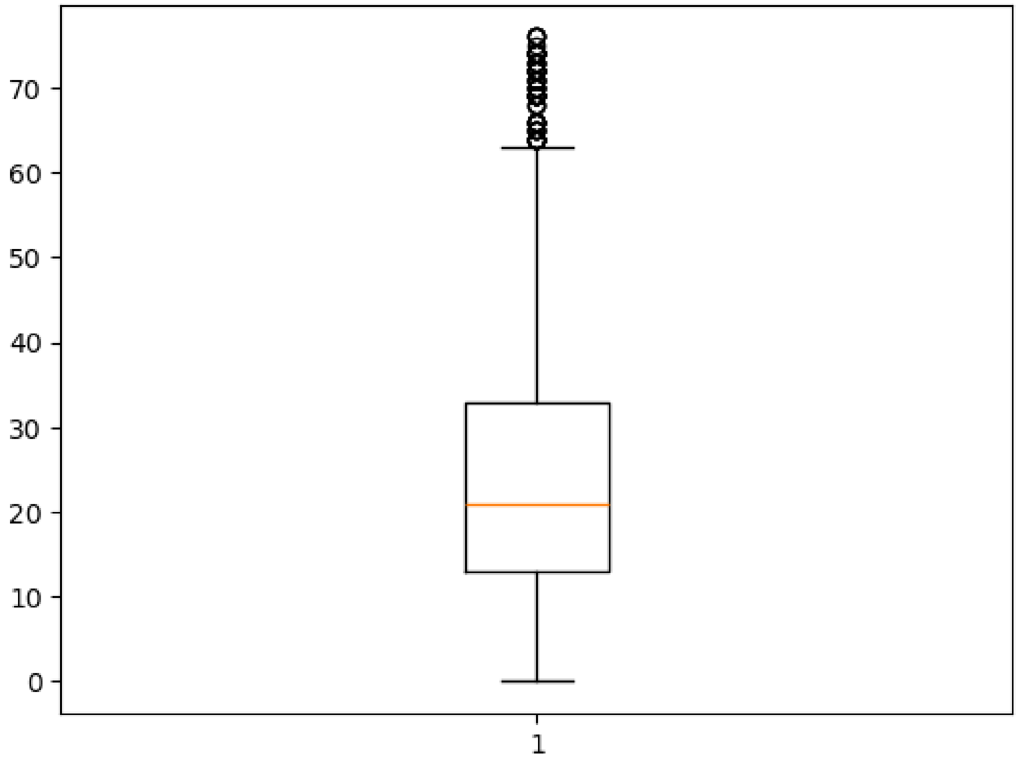
	course_id	price	num_subscribers	num_reviews	num_lectures
count	2.863000e+03	2863.000000	2863.000000	2863.000000	2863.000000
mean	7.015522e+05	61.319310	961.526854	19.405169	33.550122
std	3.429347e+05	55.905506	1232.353422	22.874128	38.369560
min	1.221400e+04	0.000000	0.000000	0.000000	0.000000
25%	4.430030e+05	20.000000	59.500000	3.000000	14.000000
50%	7.201440e+05	40.000000	438.000000	10.000000	23.000000
75%	9.909740e+05	80.000000	1404.500000	28.000000	39.000000
max	1.282064e+06	200.000000	6315.000000	101.000000	462.000000

In [234]:

```
plt.boxplot(df['num_lectures'])
```

Out[234]:

```
{'whiskers': [<matplotlib.lines.Line2D at 0x21ebea4a8d0>,
  <matplotlib.lines.Line2D at 0x21ebea4ac00>],
 'caps': [<matplotlib.lines.Line2D at 0x21ebea4ae40>,
  <matplotlib.lines.Line2D at 0x21ebea4b110>],
 'boxes': [<matplotlib.lines.Line2D at 0x21ebea4a600>],
 'medians': [<matplotlib.lines.Line2D at 0x21ebea4b050>],
 'fliers': [<matplotlib.lines.Line2D at 0x21ebea4b290>],
 'means': []}
```



In [236]:

```
Q1 = df['num_lectures'].quantile(0.25)
Q3 = df['num_lectures'].quantile(0.75)
IQR = Q3 - Q1

Lower_bound = Q1 - 1.5 * IQR
Upper_bound = Q3 + 1.5 * IQR

df['outliers'] =(df['num_lectures'] < Lower_bound) | (df['num_lectures'] > Upper_bound)
```

```
print(F"Q1:{Q1},Q3:{Q3},IQR:{IQR}")
print(F"Lower_bound : {Lower_bound},Upper_bound : {Upper_bound}")

Outliers = df[df['outliers']==True]

#print(F"\n Outliers:\n{Outliers}")
```

```
Q1:13.0,Q3:33.0,IQR:20.0
Lower_bound : -17.0,Upper_bound : 63.0
```

In [238]:

```
df_cleaned = df.drop(Outliers.index)
```

In [240]:

```
df_cleaned.head(5)
```

Out[240]:

	course_id	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	level	content_duration	published_timestamp	subject
1	1170074	10 Hand Coordination - Transfer Chord Ballad 9...	True	75.0	1593.0	1	41	Intermediate Level	1 hour	2017-04-12T19:06:34Z	Musical Instruments
2	1193886	12 Hand Coordination: Let your Hands dance wit...	True	75.0	482.0	1	47	Intermediate Level	1.5 hours	2017-04-26T18:34:57Z	Musical Instruments
3	1116700	4 Piano Hand Coordination: Fun Piano Runs in 2...	True	75.0	850.0	3	43	Intermediate Level	1 hour	2017-02-21T23:48:18Z	Musical Instruments
4	1120410	5 Piano Hand Coordination: Piano Runs in 2 B...	True	75.0	940.0	3	32	Intermediate Level	37 mins	2017-02-21T23:44:49Z	Musical Instruments
5	1122832	6 Piano Hand Coordination: Play Open 10 Ballad...	True	65.0	2015.0	3	21	Intermediate Level	44 mins	2017-03-08T17:53:36Z	Musical Instruments

In [242]:

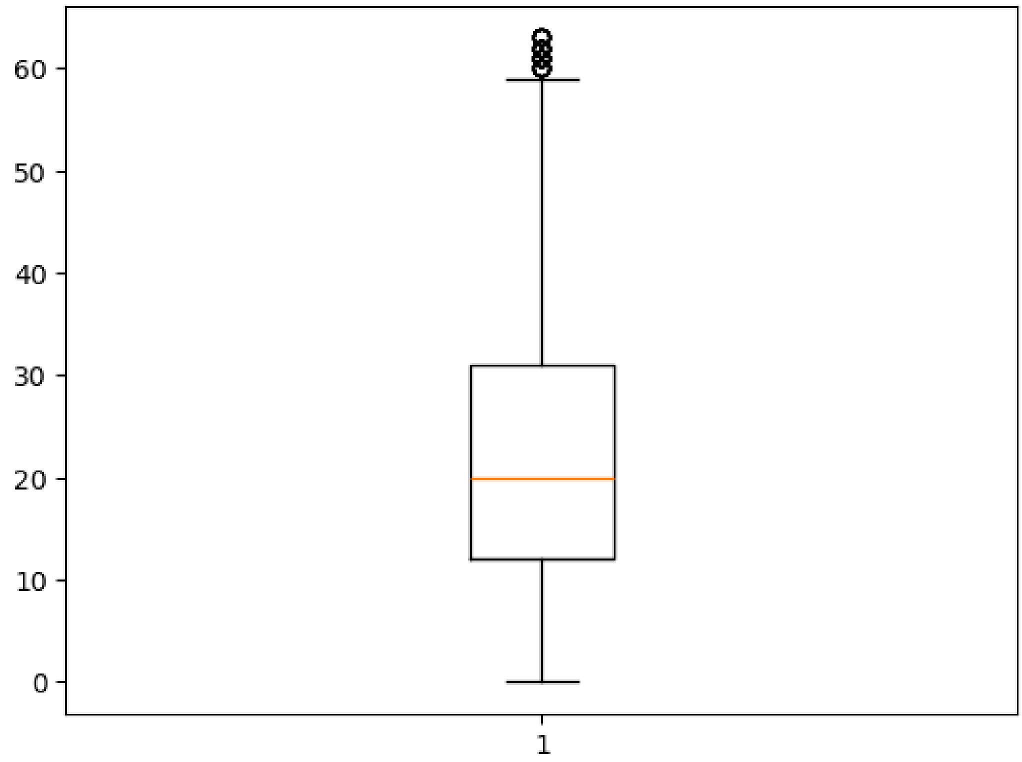
```
df=df_cleaned
```

In [244]:

```
plt.boxplot(df['num_lectures'])
```

Out[244]:

```
{'whiskers': [<matplotlib.lines.Line2D at 0x21ebeac55b0>,
  <matplotlib.lines.Line2D at 0x21ebeac5880>],
 'caps': [<matplotlib.lines.Line2D at 0x21ebeac5b20>,
  <matplotlib.lines.Line2D at 0x21ebeac5e20>],
 'boxes': [<matplotlib.lines.Line2D at 0x21ebeac5370>],
 'medians': [<matplotlib.lines.Line2D at 0x21ebeac5fd0>],
 'fliers': [<matplotlib.lines.Line2D at 0x21ebeac6270>],
 'means': []}
```



In [195]:

```
df.head()
```

Out[195]:

	course_id	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	level	content_duration	published_timestamp	subject
0	288942	1 Piano Hand Coordination: Play 10th Ballad in...	True	35.0	3137.0	18	68	All Levels	1.5 hours	2014-09-18T05:07:05Z	Musical Instruments
1	1170074	10 Hand Coordination - Transfer Chord Ballad 9...	True	75.0	1593.0	1	41	Intermediate Level	1 hour	2017-04-12T19:06:34Z	Musical Instruments
2	1193886	12 Hand Coordination: Let your Hands dance wit...	True	75.0	482.0	1	47	Intermediate Level	1.5 hours	2017-04-26T18:34:57Z	Musical Instruments
3	1116700	4 Piano Hand Coordination: Fun Piano Runs in 2...	True	75.0	850.0	3	43	Intermediate Level	1 hour	2017-02-21T23:48:18Z	Musical Instruments
4	1120410	5 Piano Hand Coordination: Piano Runs in 2 B...	True	75.0	940.0	3	32	Intermediate Level	37 mins	2017-02-21T23:44:49Z	Musical Instruments

In [196]:

```
df.describe()
```

Out[196]:

	course_id	price	num_subscribers	num_reviews	num_lectures
count	2.640000e+03	2640.000000	2640.000000	2640.000000	2640.000000
mean	7.038863e+05	58.803858	959.807432	18.452273	25.365530

	course_id	price	num_subscribers	num_reviews	num_lectures
std	3.442906e+05	54.744054	1242.561449	22.116660	16.123743
min	1.221400e+04	0.000000	0.000000	0.000000	0.000000
25%	4.451140e+05	20.000000	56.000000	3.000000	13.000000
50%	7.215100e+05	40.000000	426.000000	10.000000	21.000000
75%	9.939315e+05	70.000000	1375.500000	26.000000	34.000000
max	1.282064e+06	200.000000	6315.000000	101.000000	76.000000

In [197]:

```
df.head()
```

Out[197]:

	course_id	course_title	is_paid	price	num_subscribers	num_reviews	num_lectures	level	content_duration	published_timestamp	subject
0	288942	1 Piano Hand Coordination: Play 10th Ballad in...	True	35.0	3137.0	18	68	All Levels	1.5 hours	2014-09-18T05:07:05Z	Musical Instruments
1	1170074	10 Hand Coordination - Transfer Chord Ballad 9...	True	75.0	1593.0	1	41	Intermediate Level	1 hour	2017-04-12T19:06:34Z	Musical Instruments
2	1193886	12 Hand Coordination: Let your Hands dance wit...	True	75.0	482.0	1	47	Intermediate Level	1.5 hours	2017-04-26T18:34:57Z	Musical Instruments
3	1116700	4 Piano Hand Coordination: Fun Piano Runs in 2...	True	75.0	850.0	3	43	Intermediate Level	1 hour	2017-02-21T23:48:18Z	Musical Instruments
4	1120410	5 Piano Hand Coordination: Piano Runs in 2 B...	True	75.0	940.0	3	32	Intermediate Level	37 mins	2017-02-21T23:44:49Z	Musical Instruments

In [198]:

```
df.shape
```

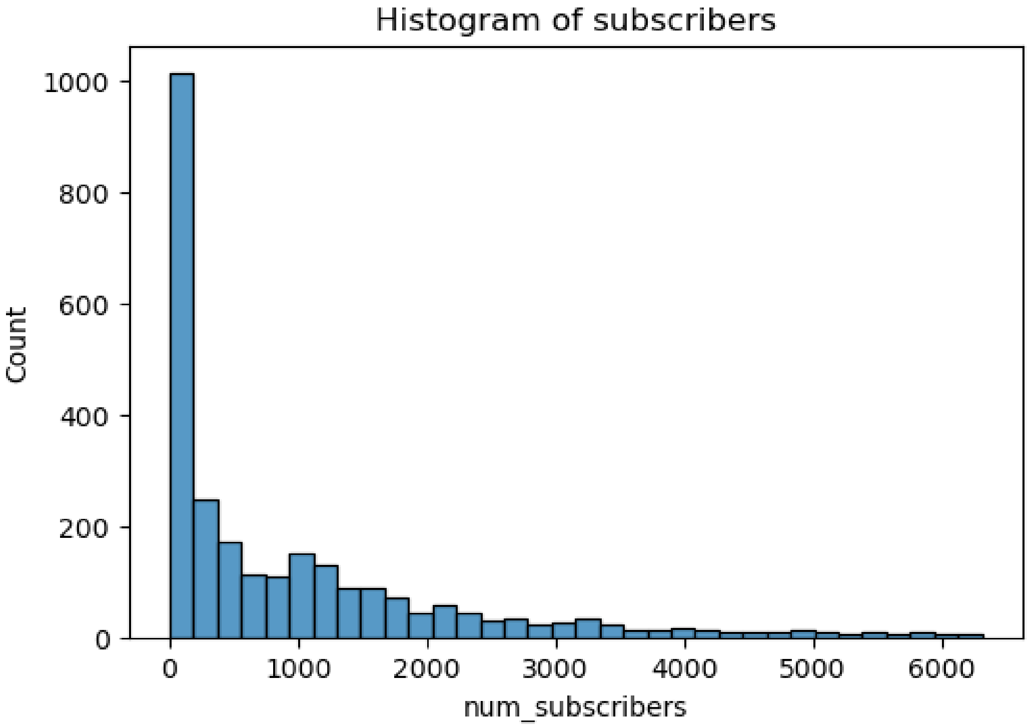
Out[198]:

```
(2640, 12)
```

Univariate Analysis

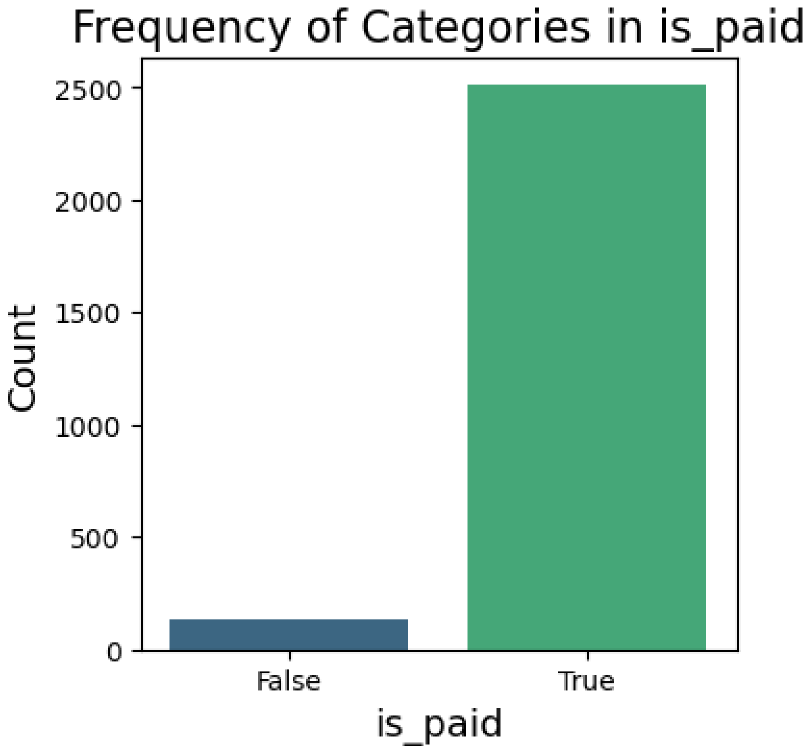
In [200]:

```
plt.figure(figsize=(6,4))
sns.histplot(df['num_subscribers'])
bins=10,
kde=True
plt.title("Histogram of subscribers")
plt.show()
```



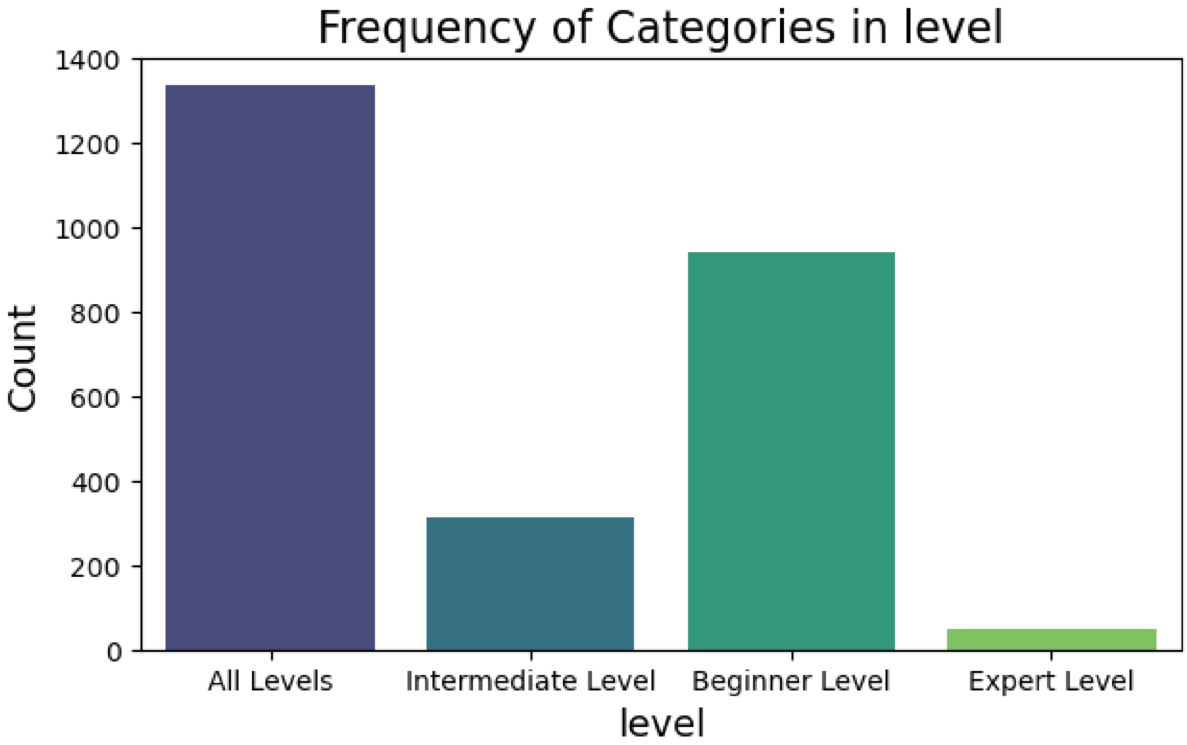
In [201]:

```
plt.figure(figsize=(4, 4))
sns.countplot(x='is_paid', data=df, palette='viridis')
plt.title(f'Frequency of Categories in {'is_paid'}', fontsize=16)
plt.xlabel('is_paid', fontsize=14)
plt.ylabel('Count', fontsize=14)
plt.show()
```



In [202]:

```
plt.figure(figsize=(7,4))
sns.countplot(x='level', data=df, palette='viridis')
plt.title(f'Frequency of Categories in {'level'}', fontsize=16)
plt.xlabel('level', fontsize=14)
plt.ylabel('Count', fontsize=14)
plt.show()
```



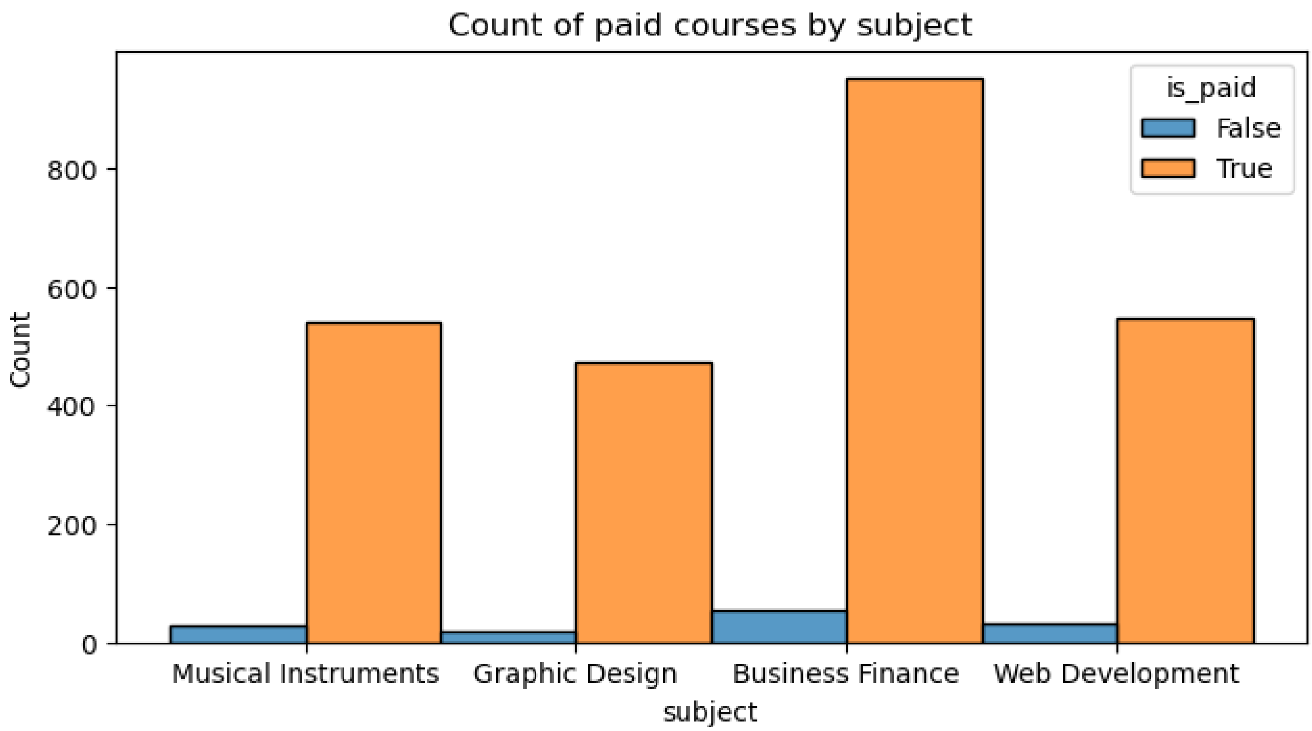
Bivariate analysis

In [204]:

```
plt.figure(figsize=(8,4))
sns.histplot(x='subject', hue='is_paid', data=df, stat="count", multiple="dodge")
plt.title('Count of paid courses by subject')
```

Out[204]:

```
Text(0.5, 1.0, 'Count of paid courses by subject')
```

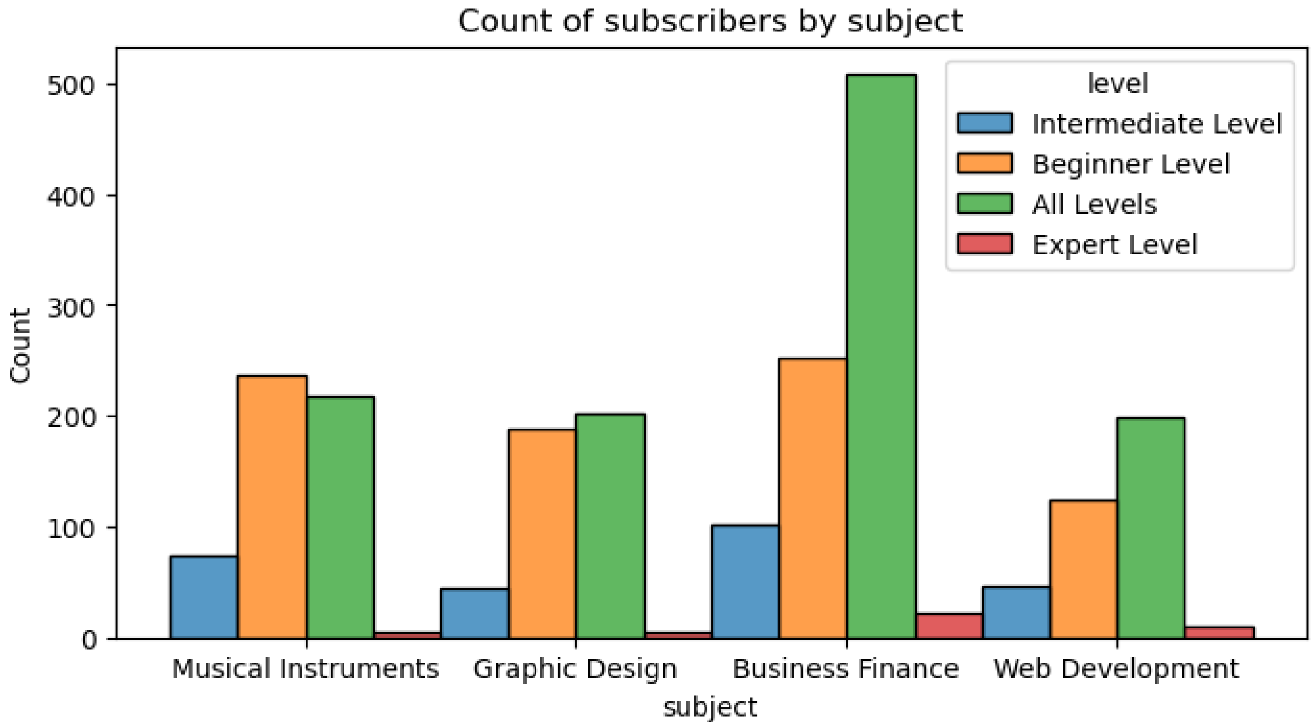


In [255]:

```
 plt.figure(figsize=(8,4))
sns.histplot(x='subject', hue='level', data=df, stat="count", multiple="dodge")
plt.title('Count of subscribers by subject')
```

Out[255]:

```
Text(0.5, 1.0, 'Count of subscribers by subject')
```



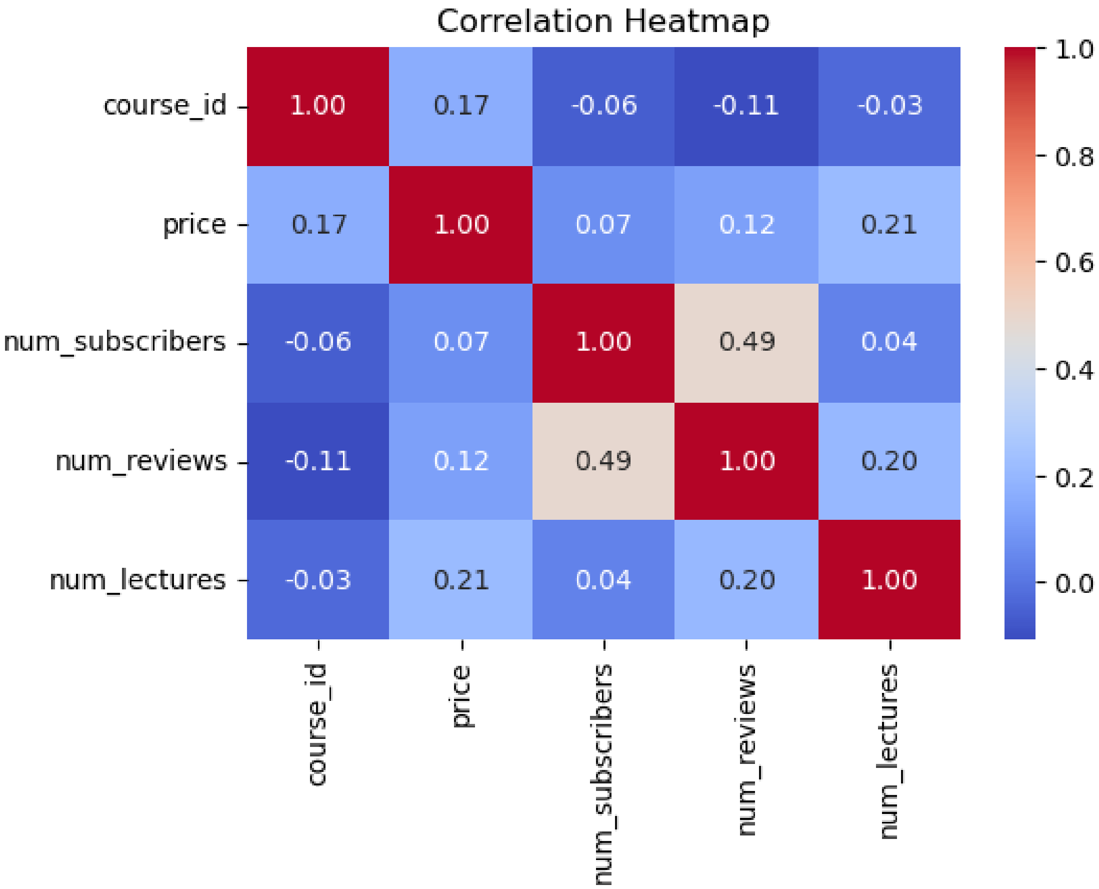
corelation matrix

In [206]:

```
 df_numeric = df.select_dtypes(include=['float64', 'int64'])
corr_matrix = df_numeric.corr()
```

In [207]:

```
 plt.figure(figsize=(6,4))
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', fmt=".2f")
plt.title('Correlation Heatmap')
plt.show()
```



In [ ]: