2 Year-2 Semester Data Science Results Analysis

In [1]:
```
import pandas as pd
import numpy as np
```

Import data

In [2]:
```
df = pd.read_csv('data.csv')
```

In [3]:
```
df
```

Out[3]:

	Unnamed: 0	Roll Number	Name	BEFA	Befa_Status	DM	Dm_Status	OS	Os_Status	DBMS	...	OS-La
0	0	22J41A6701	A Vinayaka Sai	84	Pass	92	Pass	90	Pass	75	...	10
1	1	22J41A6702	Addanki Devi Krishna	74	Pass	81	Pass	62	Pass	83	...	9
2	2	22J41A6703	Akshay Agarwal	83	Pass	88	Pass	70	Pass	75	...	10
3	3	22J41A6704	Detained	Detained	Detained	Detained	Detained	Detained	Detained	Detained	...	Detaine
4	4	22J41A6705	Bandarupalli Harshitha	64	Pass	73	Pass	70	Pass	62	...	9
...	...	...	...	...	...	...	...	...	...	...	...	
209	209	23J45A6717	Parimi Tharun	51	Pass	46	Pass	61	Pass	60	...	9
210	210	23J45A6718	Seelam Naga Krishna Reddy	53	Pass	37	Fail	61	Pass	53	...	9
211	211	23J45A6719	Talari Mallesh Mudhiraj	60	Pass	29	Fail	52	Pass	45	...	9
212	212	23J45A6720	Thogaru Sravan Kumar	71	Pass	65	Pass	67	Pass	63	...	9
213	213	23J45A6721	Vavilla Chandrashekar	73	Pass	80	Pass	73	Pass	70	...	9

214 rows × 23 columns

In [4]:
```
df.columns
```

Out[4]:
```
Index(['Unnamed: 0', 'Roll Number', 'Name', 'BEFA', 'Befa_Status', 'DM',
       'Dm_Status', 'OS', 'Os_Status', 'DBMS', 'Dbms_Status', 'DPA',
       'Dpa_Status', 'OS-Lab', 'DBMS-Lab', 'RTL-Lab', 'SD-Lab', 'ES',
       'Total_Marks', 'SGPA', 'CGPA', 'Subjects_due', 'Section'],
      dtype='object')
```

Subject Wise Average marks

In [5]:
```
subject_columns = ['BEFA', 'DM', 'OS', 'DBMS', 'DPA', 'OS-Lab', 'DBMS-Lab', 'SD-Lab', 'ES']
df[subject_columns] = df[subject_columns].apply(pd.to_numeric, errors='coerce')
subject_wise_average_marks = df[subject_columns].mean()
subject_wise_average_marks
```

Out[5]:
```
BEFA        68.605769
DM          64.947115
OS          67.451923
DBMS        64.735577
DPA         66.413462
OS-Lab      96.692308
DBMS-Lab    93.750000
SD-Lab      94.500000
ES          69.567308
dtype: float64
```

Subject wise Number of Passed and Failed Students, Pass Percentage

In [6]:
```
status_columns = ['Befa_Status', 'Dm_Status', 'Os_Status', 'Dbms_Status', 'Dpa_Status']
subject_names = ['BEFA', 'DM', 'OS', 'DBMS', 'DPA']
pass_counts = {}
fail_counts = {}
pass_percentages = {}
```

```
for col in status_columns:
    pass_counts[col] = df[col].value_counts().get('Pass', 0)
    fail_counts[col] = df[col].value_counts().get('Fail', 0)
    total_students = pass_counts[col] + fail_counts[col]
    pass_percentages[col] = (pass_counts[col] / total_students * 100) if total_students > 0 else 0
subject_wise_results_df = pd.DataFrame({
    'Subjects': subject_names,
    'No. of students passed': list(pass_counts.values()),
    'No. of students Failed': list(fail_counts.values()),
    'Pass Percentage': list(pass_percentages.values())
})
```

In [7]:
```
subject_wise_results = subject_wise_results_df.sort_values(by=['No. of students passed'], ascending=False)
subject_wise_new_results = subject_wise_results.reset_index(drop=True)
subject_wise_new_results
```

Out[7]:

	Subjects	No. of students passed	No. of students Failed	Pass Percentage
0	DPA	199	9	95.673077
1	BEFA	198	10	95.192308
2	OS	194	14	93.269231
3	DBMS	187	21	89.903846
4	DM	175	33	84.134615

Subject wise Number of Passed and Failed Students, Pass Percentage - Section wise

In [8]:
```
status_columns = ['Befa_Status', 'Dm_Status', 'Os_Status', 'Dbms_Status', 'Dpa_Status']
subject_names = ['BEFA', 'DM', 'OS', 'DBMS', 'DPA']
sections = df['Section'].unique()
results = []
for section in sections:
    section_data = df[df['Section'] == section]

    for col in status_columns:
        pass_count = section_data[col].value_counts().get('Pass', 0)
        fail_count = section_data[col].value_counts().get('Fail', 0) + section_data[col].value_counts().get('De

        total_students = pass_count + fail_count
        pass_percentage = (pass_count / total_students * 100) if total_students > 0 else 0

        results.append({
            'Section': section,
            'Subject': subject_names[status_columns.index(col)],
            'No. of students passed': pass_count,
            'No. of students Failed': fail_count,
            'Total Students': total_students,
            'Pass Percentage': pass_percentage
        })
section_wise_results_df = pd.DataFrame(results)
section_wise_results_df
```

Out[8]:

	Section	Subject	No. of students passed	No. of students Failed	Total Students	Pass Percentage
0	A	BEFA	65	7	72	90.277778
1	A	DM	60	12	72	83.333333
2	A	OS	64	8	72	88.888889
3	A	DBMS	61	11	72	84.722222
4	A	DPA	63	9	72	87.500000
5	B	BEFA	64	7	71	90.140845
6	B	DM	59	12	71	83.098592
7	B	OS	66	5	71	92.957746
8	B	DBMS	63	8	71	88.732394
9	B	DPA	68	3	71	95.774648
10	C	BEFA	69	2	71	97.183099
11	C	DM	56	15	71	78.873239
12	C	OS	64	7	71	90.140845
13	C	DBMS	63	8	71	88.732394
14	C	DPA	68	3	71	95.774648

Section Wise Total no. of students, no. of students passed, no. of students failed and pass percentage, Fail percentage

In [9]:

```python
sections = df['Section'].unique()
results = []

for section in sections:
    section_data = df[df['Section'] == section]

    pass_count = (section_data['Subjects_due'] == '0').sum()
    fail_count = (section_data['Subjects_due'].isin(['1', '2', '3', '4', '5'])).sum()
    detained_count = (section_data['Subjects_due'] == 'Detained').sum()

    total_students = pass_count + fail_count + detained_count
    pass_percentage = (pass_count / (pass_count + fail_count) * 100) if (pass_count + fail_count) > 0 else 0
    fail_percentage = (fail_count / (pass_count + fail_count) * 100) if (pass_count + fail_count) > 0 else 0

    results.append({
        'Section': section,
        'Total Students': total_students,
        'No. of students passed': pass_count,
        'No. of students Failed': fail_count,
        'No. of Students Detained': detained_count,
        'Pass Percentage': pass_percentage,
        'Fail Percentage' : fail_percentage
    })
Section_results_df = pd.DataFrame(results)
Section_results_df
```

Out[9]:

	Section	Total Students	No. of students passed	No. of students Failed	No. of Students Detained	Pass Percentage	Fail Percentage
0	A	72	53	14	5	79.104478	20.895522
1	B	71	51	20	0	71.830986	28.169014
2	C	71	53	17	1	75.714286	24.285714

Filtering The 10 Top Students by CGPA

In [10]:

```python
filtered_df = df[(df['Name'] != 'Detained') & (df['CGPA'].notna())]
top_students_by_cgpa_df = filtered_df.sort_values(by='CGPA', ascending=False)
top_10_students = top_students_by_cgpa_df[['Roll Number', 'Name', 'Total_Marks', 'SGPA', 'CGPA', 'Section']].hea
top_10_students
```

Out[10]:

	Roll Number	Name	Total_Marks	SGPA	CGPA	Section
46	22J41A6747	Prodduturi Nikitha	863	9.35	9.51	A
190	22J41A67K1	Vedam Venkata Sarma	832	8.85	9.5	C
136	22J41A67D7	Barki Pavani	853	9.15	9.49	C
66	22J41A6767	Armoor Rishika Reddy	846	9.15	9.48	B
18	22J41A6719	Gopal Likhitha	854	9.15	9.45	A
7	22J41A6708	Bogala Aravindar Reddy	858	9.35	9.44	A
145	22J41A67E6	Gnana Teja Kummara Giri	844	8.85	9.4	C
31	22J41A6732	Mali Sreeja	870	9.35	9.39	A
0	22J41A6701	A Vinayaka Sai	854	9.35	9.31	A
156	22J41A67F7	Kavali Sreenidhi	841	9.05	9.3	C

Filtering The 10 Top Students by SGPA

In [11]:

```
top_students_by_sgpa_df = filtered_df.sort_values(by='SGPA', ascending=False)
top_10_students = top_students_by_sgpa_df[['Roll Number', 'Name', 'Total_Marks', 'SGPA', 'CGPA', 'Section']].hea
top_10_students
```

Out[11]:

	Roll Number	Name	Total_Marks	SGPA	CGPA	Section
0	22J41A6701	A Vinayaka Sai	854	9.35	9.31	A
46	22J41A6747	Prodduturi Nikitha	863	9.35	9.51	A
7	22J41A6708	Bogala Aravindar Reddy	858	9.35	9.44	A
31	22J41A6732	Mali Sreeja	870	9.35	9.39	A
37	22J41A6738	Mitta Varshini	838	9.2	9.18	A
59	22J41A6760	Thota Pranusha	854	9.2	9.14	A
12	22J41A6713	Dundangi Govind	848	9.2	9.28	A
180	22J41A67J1	Sadiya	842	9.2	9.07	C
18	22J41A6719	Gopal Likhitha	854	9.15	9.45	A
66	22J41A6767	Armoor Rishika Reddy	846	9.15	9.48	B

Filtering The Top 10 Students by Total Marks

In [12]:

```
df['Total_Marks'] = pd.to_numeric(df['Total_Marks'], errors='coerce')
top_students_by_marks_df = df.sort_values(by='Total_Marks', ascending=False)
top_10_students_by_marks = top_students_by_marks_df[['Roll Number', 'Name', 'Total_Marks', 'SGPA', 'CGPA', 'Sec
top_10_students_by_marks
```

Out[12]:

	Roll Number	Name	Total_Marks	SGPA	CGPA	Section
31	22J41A6732	Mali Sreeja	870.0	9.35	9.39	A
46	22J41A6747	Prodduturi Nikitha	863.0	9.35	9.51	A
7	22J41A6708	Bogala Aravindar Reddy	858.0	9.35	9.44	A
0	22J41A6701	A Vinayaka Sai	854.0	9.35	9.31	A
59	22J41A6760	Thota Pranusha	854.0	9.2	9.14	A
18	22J41A6719	Gopal Likhitha	854.0	9.15	9.45	A
136	22J41A67D7	Barki Pavani	853.0	9.15	9.49	C
12	22J41A6713	Dundangi Govind	848.0	9.2	9.28	A
66	22J41A6767	Armoor Rishika Reddy	846.0	9.15	9.48	B
9	22J41A6710	Bolla Dhanalakshmi	845.0	8.85	9.23	A

Section Wise Top 5 Students

In [13]:

```
df['CGPA'] = pd.to_numeric(df['CGPA'], errors='coerce')
filtered_df = df[(df['Name'] != 'Detained') & (df['CGPA'].notna())]
top_students_per_section = filtered_df.groupby('Section').apply(
    lambda x: x.nlargest(5, 'CGPA')
).reset_index(drop=True)
```

```
top_students_per_section = top_students_per_section[['Roll Number', 'Name', 'Total_Marks', 'SGPA', 'CGPA', 'Sec
top_students_per_section
```

```
C:\Users\sriga\AppData\Local\Temp\ipykernel_6448\457987250.py:3: DeprecationWarning: DataFrameGroupBy.apply oper
ated on the grouping columns. This behavior is deprecated, and in a future version of pandas the grouping column
s will be excluded from the operation. Either pass `include_groups=False` to exclude the groupings or explicitly
select the grouping columns after groupby to silence this warning.
  top_students_per_section = filtered_df.groupby('Section').apply(
```

Out[13]:

	Roll Number	Name	Total_Marks	SGPA	CGPA	Section
0	22J41A6747	Prodduturi Nikitha	863.0	9.35	9.51	A
1	22J41A6719	Gopal Likhitha	854.0	9.15	9.45	A
2	22J41A6708	Bogala Aravindar Reddy	858.0	9.35	9.44	A
3	22J41A6732	Mali Sreeja	870.0	9.35	9.39	A
4	22J41A6701	A Vinayaka Sai	854.0	9.35	9.31	A
5	22J41A6767	Armoor Rishika Reddy	846.0	9.15	9.48	B
6	22J41A6783	K B Neha	827.0	8.85	9.29	B
7	22J41A6774	Bhukya Jani	830.0	8.85	9.19	B
8	22J41A67B6	Shaik Shaikshavali	820.0	8.55	9.19	B
9	22J41A6794	Mangali Manasa	826.0	8.75	9.14	B
10	22J41A67K1	Vedam Venkata Sarma	832.0	8.85	9.50	C
11	22J41A67D7	Barki Pavani	853.0	9.15	9.49	C
12	22J41A67E6	Gnana Teja Kummara Giri	844.0	8.85	9.40	C
13	22J41A67F7	Kavali Sreenidhi	841.0	9.05	9.30	C
14	22J41A67K0	Vangari Karthik	841.0	9	9.26	C

Section wise Detained students

In [14]:

```
detained_students = df[df['Name'] == 'Detained']
detained_count_per_section = detained_students.groupby('Section').size().reset_index(name='Detained Count')

detained_count_per_section
```

Out[14]:

	Section	Detained Count
0	A	5
1	C	1

Section wise highest CGPA

In [15]:

```
df['CGPA'] = pd.to_numeric(df['CGPA'], errors='coerce')
highest_cgpa_per_section = df.loc[df.groupby('Section')['CGPA'].idxmax()]
cgpa_result = highest_cgpa_per_section[['Section', 'Roll Number', 'Name', 'CGPA']]

cgpa_result
```

Out[15]:

	Section	Roll Number	Name	CGPA
46	A	22J41A6747	Prodduturi Nikitha	9.51
66	B	22J41A6767	Armoor Rishika Reddy	9.48
190	C	22J41A67K1	Vedam Venkata Sarma	9.50

Visualizing the Outcomes

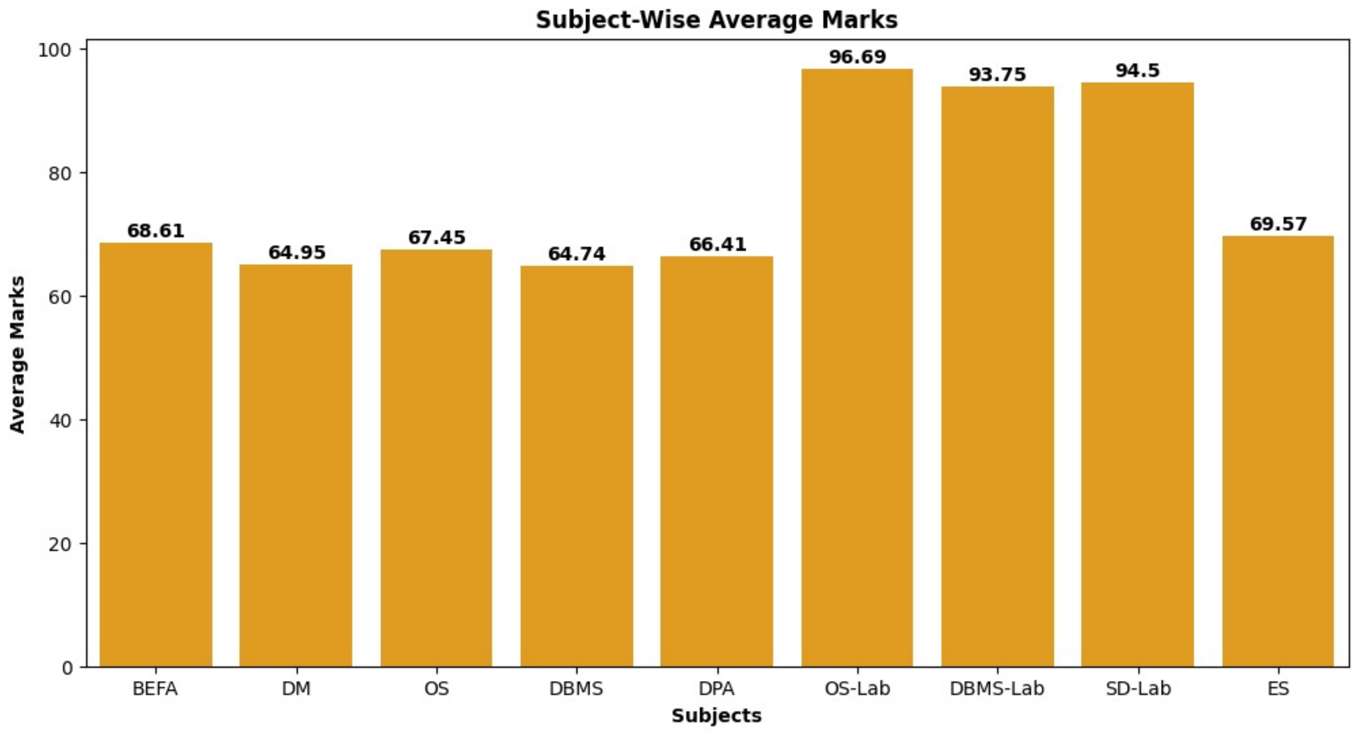
In [16]:

```
import matplotlib.pyplot as plt
import seaborn as sns
```

Subject Wise Average marks

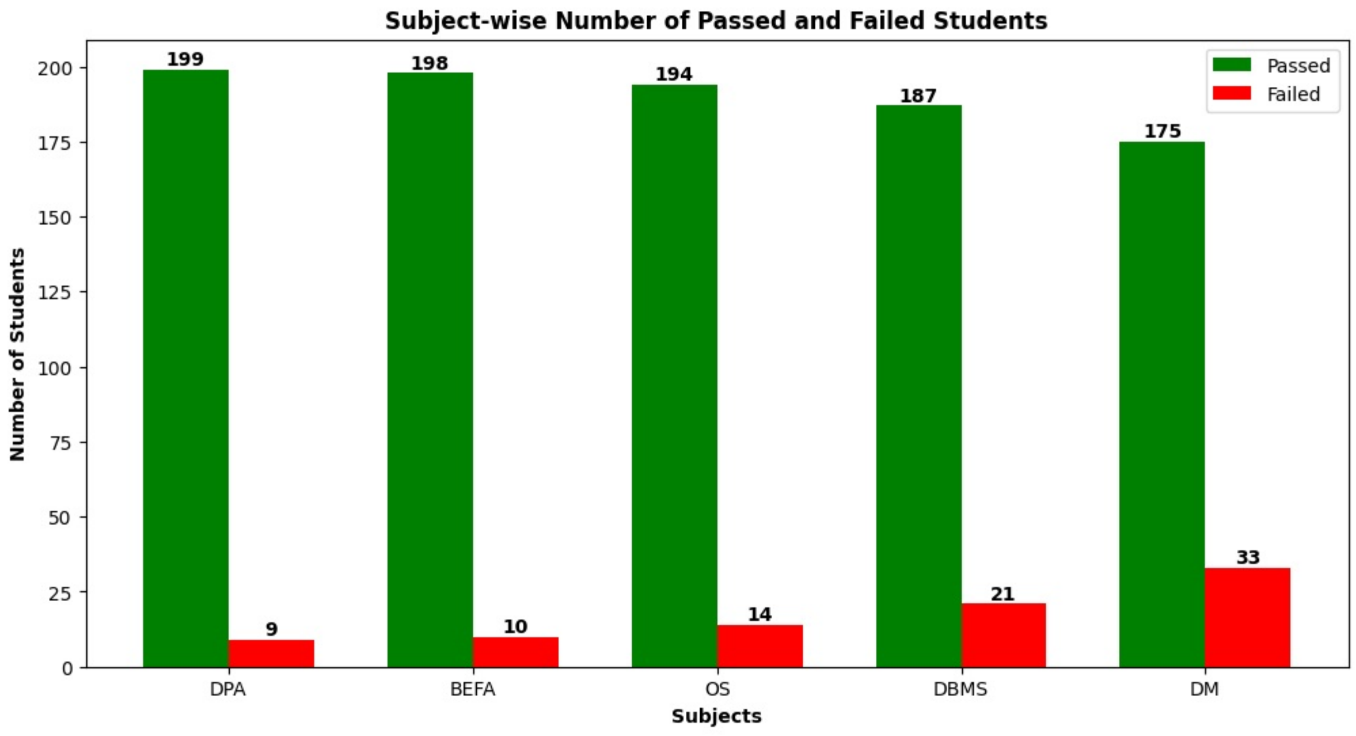
In [17]:

```
plt.figure(figsize=(12, 6))
sns.barplot(x=subject_wise_average_marks.index, y=subject_wise_average_marks.values, color="orange")
plt.title("Subject-Wise Average Marks", fontweight='bold')
plt.xlabel("Subjects", fontweight='bold')
plt.ylabel("Average Marks", fontweight='bold')

for i, value in enumerate(subject_wise_average_marks.values):
    plt.text(i, value + 1, round(value, 2), ha='center', color='black', fontweight='bold')

plt.show()
```



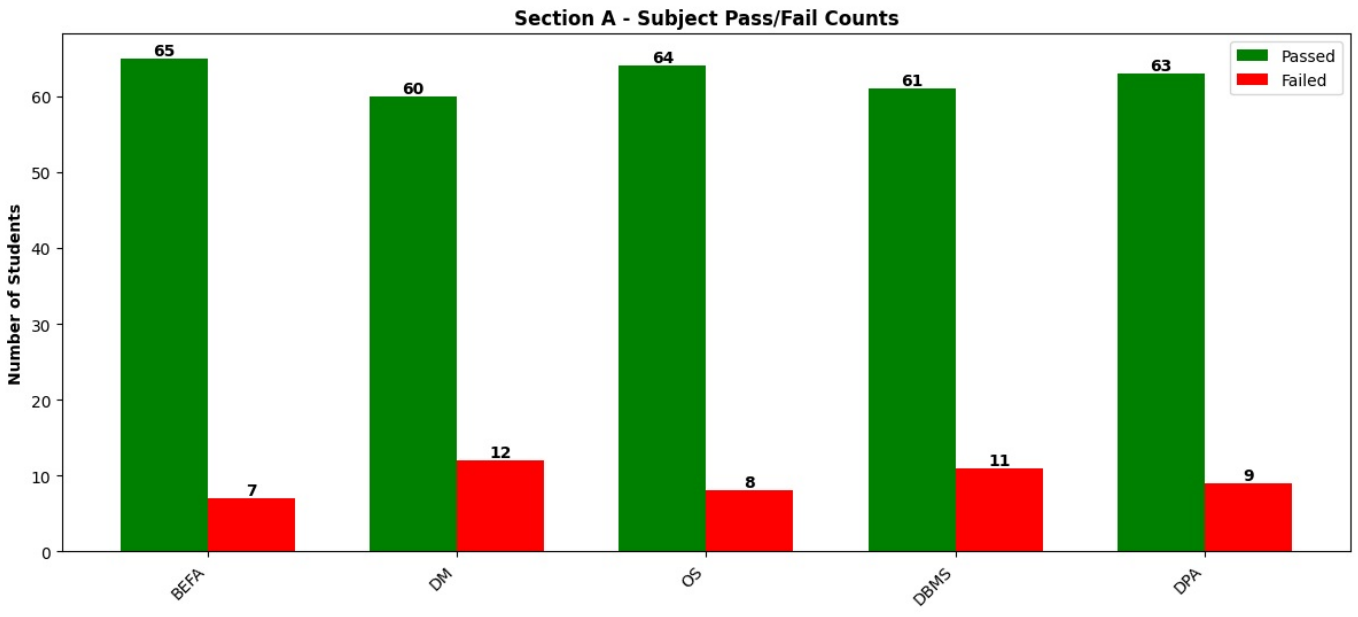
Subject wise Number of Passed and Failed Students

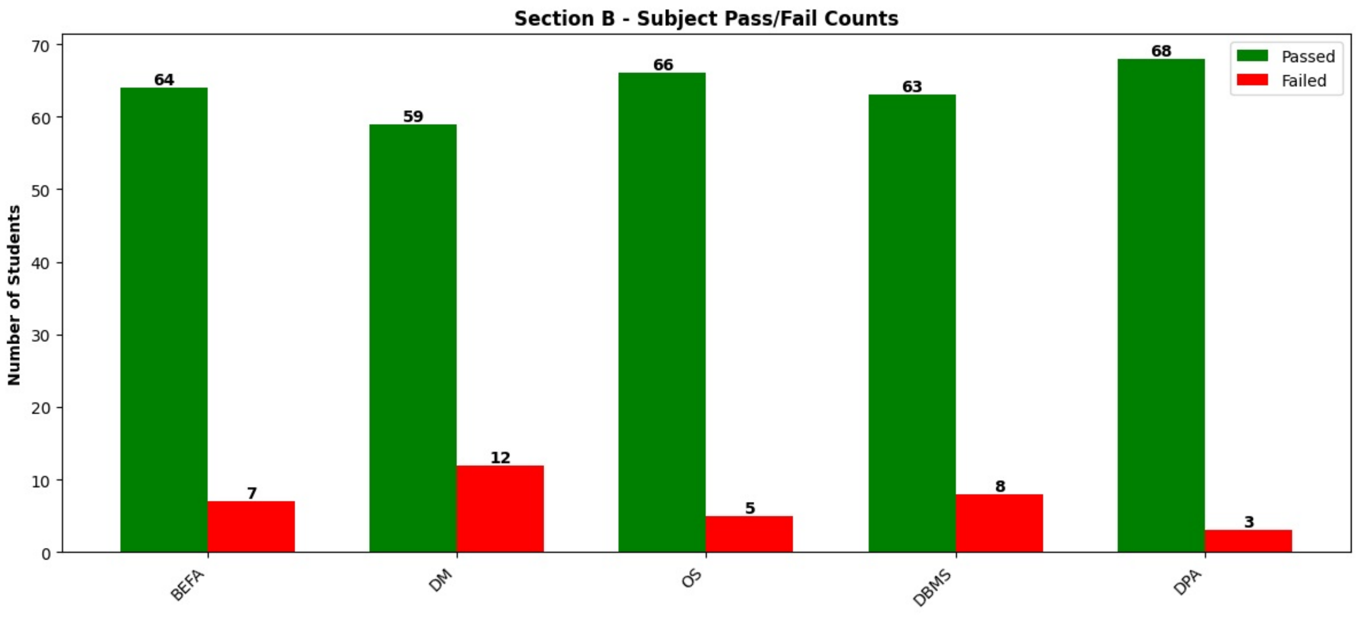
In [18]:
```
fig, ax = plt.subplots(figsize=(12, 6))
bar_width = 0.35
index = range(len(subject_names))
bars_passed = ax.bar(index, subject_wise_new_results['No. of students passed'], bar_width, label='Passed', colo
bars_failed = ax.bar([i + bar_width for i in index], subject_wise_new_results['No. of students Failed'], bar_wi

ax.set_xticks([i + bar_width / 2 for i in index])
ax.set_xticklabels(subject_wise_new_results['Subjects'])
ax.set_ylabel('Number of Students', fontweight='bold')
ax.set_xlabel('Subjects', fontweight='bold')
ax.set_title('Subject-wise Number of Passed and Failed Students', fontweight='bold')
ax.legend()

for bar in bars_passed:
    yval = bar.get_height()
    ax.text(bar.get_x() + bar.get_width()/2, yval, int(yval), ha='center', va='bottom', fontweight='bold')

for bar in bars_failed:
    yval = bar.get_height()
    ax.text(bar.get_x() + bar.get_width()/2, yval, int(yval), ha='center', va='bottom', fontweight='bold')

plt.show()
```

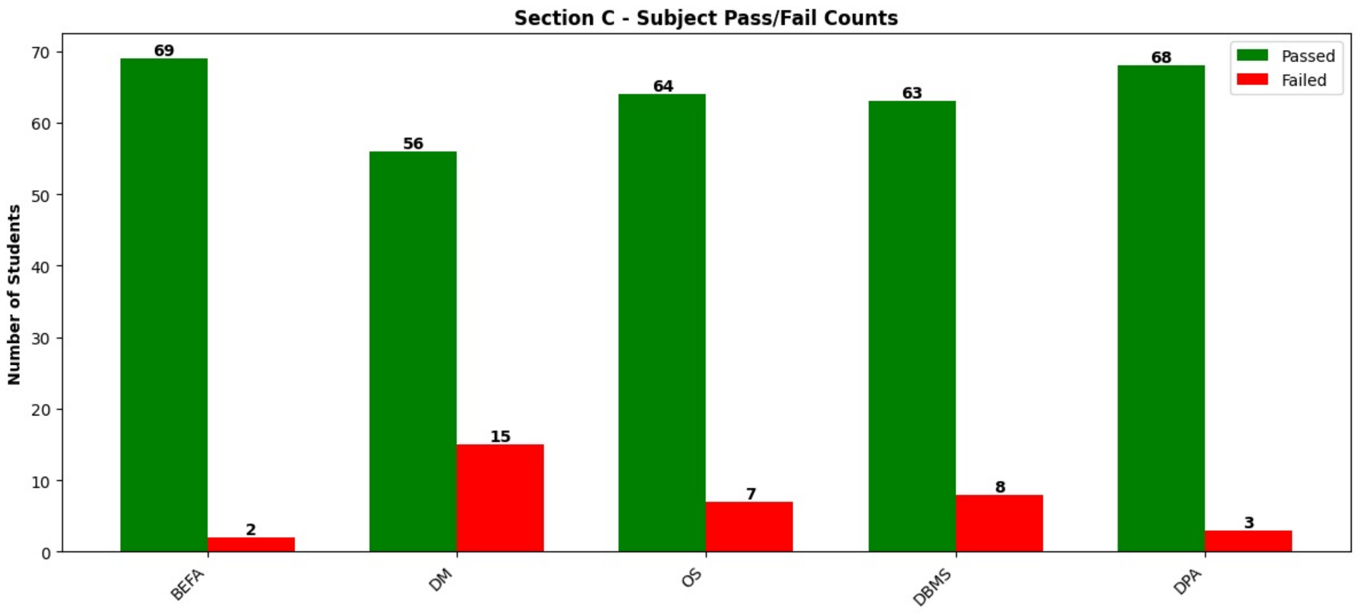


Subject wise Number of Passed and Failed Students - Section wise

In [19]:
```python
# status_columns = ['Befa_Status', 'Dm_Status', 'Os_Status', 'Dbms_Status', 'Dpa_Status']
subject_names = ['BEFA', 'DM', 'OS', 'DBMS', 'DPA']
sections = df['Section'].unique()

for section in sections:
    section_data = df[df['Section'] == section]
    results = []

    for col in status_columns:
        pass_count = section_data[col].value_counts().get('Pass', 0)
        fail_count = section_data[col].value_counts().get('Fail', 0) + section_data[col].value_counts().get('De

        results.append({
            'Subject': subject_names[status_columns.index(col)],
            'No. of students passed': pass_count,
            'No. of students Failed': fail_count,
        })

    section_wise_results_df = pd.DataFrame(results)
    fig, ax = plt.subplots(figsize=(12, 6))

    width = 0.35
    index = np.arange(len(section_wise_results_df))

    bars_passed = ax.bar(index - width/2, section_wise_results_df['No. of students passed'], width, label='Passe
    bars_failed = ax.bar(index + width/2, section_wise_results_df['No. of students Failed'], width, label='Faile

    ax.set_xticks(index)
    ax.set_xticklabels(section_wise_results_df['Subject'], rotation=45, ha='right')
    ax.set_ylabel('Number of Students', fontweight='bold')
    ax.set_title(f'Section {section} - Subject Pass/Fail Counts', fontweight='bold')
    ax.legend()

    for bar in bars_passed:
        yval = bar.get_height()
        ax.text(bar.get_x() + bar.get_width()/2, yval, int(yval), ha='center', va='bottom', fontweight='bold')

    for bar in bars_failed:
        yval = bar.get_height()
        ax.text(bar.get_x() + bar.get_width()/2, yval, int(yval), ha='center', va='bottom', fontweight='bold')

    plt.tight_layout(rect=[0, 0.03, 1, 0.95])
    plt.show()
```

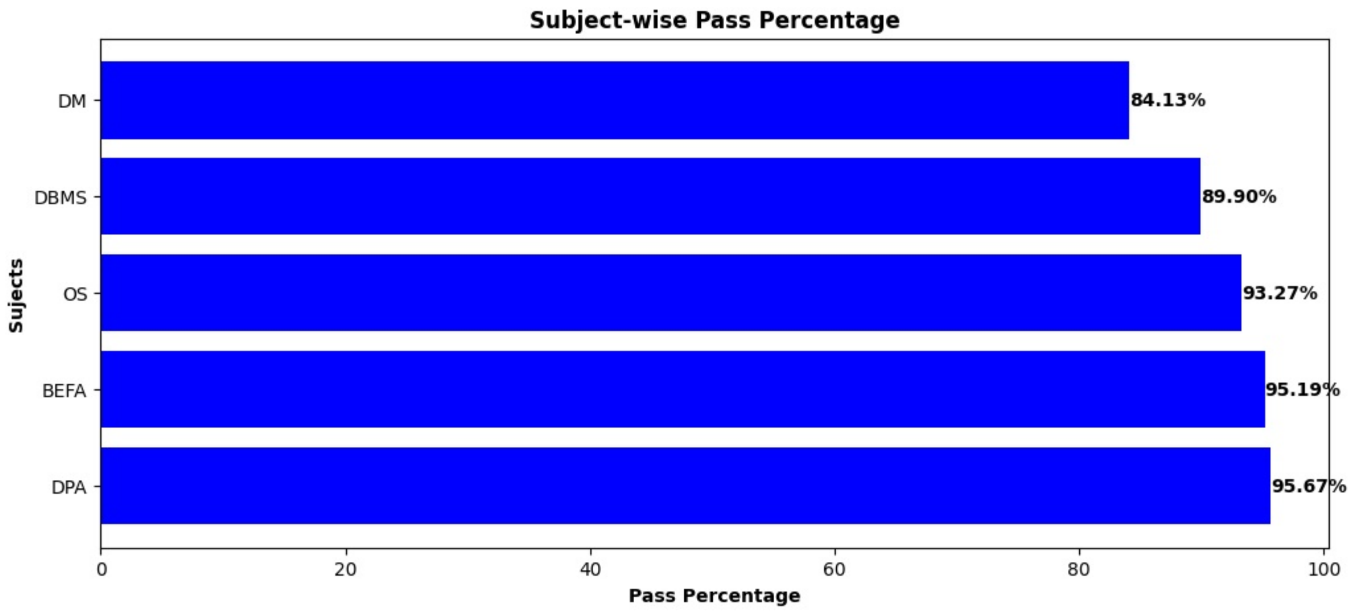






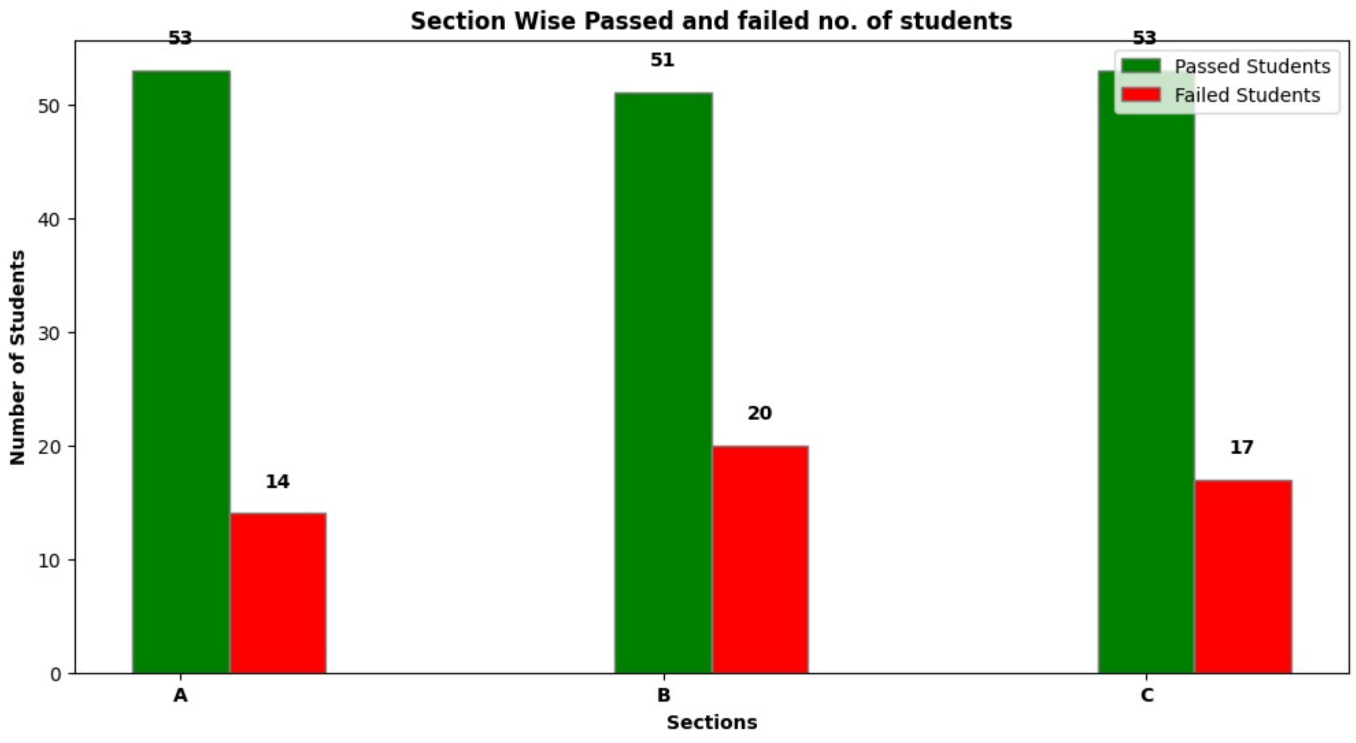
Subject wise Pass Percentage

In [21]:
```
# Visualization
plt.figure(figsize=(12, 5))
bar_width = 0.2
bars = plt.barh(subject_wise_new_results['Subjects'], subject_wise_new_results['Pass Percentage'], color='blue'

plt.xlabel('Pass Percentage', fontweight='bold')
plt.ylabel('Sujects', fontweight='bold')
plt.title('Subject-wise Pass Percentage', fontweight='bold')

for bar in bars:
    plt.text(bar.get_width(), bar.get_y() + bar.get_height()/2, f'{bar.get_width():.2f}%', ha='left', va='cente

plt.show()
```



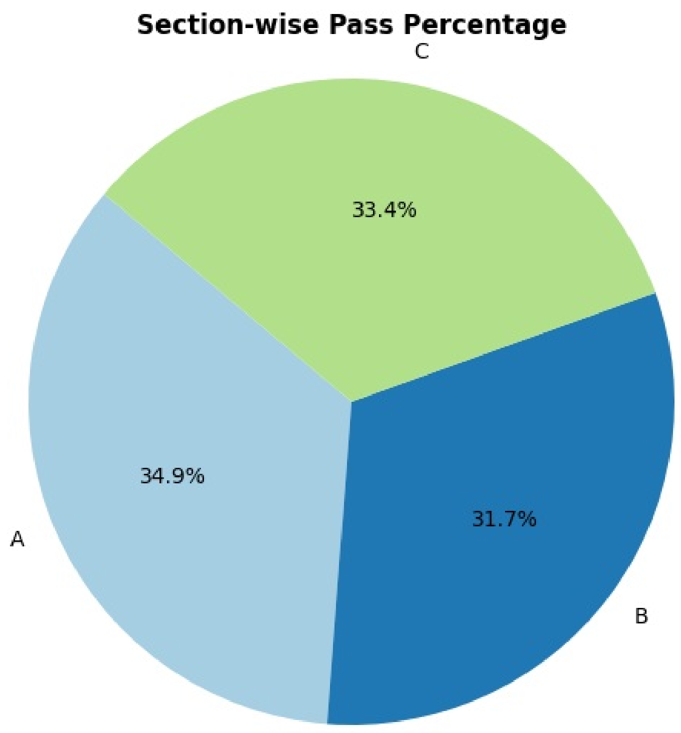
Section wise Total number of students, Total no. of passed and Total no.of failed students

In [22]:
```
plt.figure(figsize=(12, 6))
bar_width = 0.2
r1 = range(len(Section_results_df))
r2 = [x + bar_width for x in r1]
r3 = [x + bar_width for x in r2]

plt.bar(r2, Section_results_df['No. of students passed'], color='green', width=bar_width, edgecolor='grey', labe
plt.bar(r3, Section_results_df['No. of students Failed'], color='red', width=bar_width, edgecolor='grey', label=

for i in range(len(Section_results_df)):
    plt.text(r2[i], Section_results_df['No. of students passed'][i] + 2, Section_results_df['No. of students pa
    plt.text(r3[i], Section_results_df['No. of students Failed'][i] + 2, Section_results_df['No. of students Fa

plt.xlabel('Sections', fontweight='bold')
plt.ylabel('Number of Students', fontweight='bold')
plt.title('Section Wise Passed and failed no. of students', fontweight='bold')
plt.xticks([r + bar_width for r in range(len(Section_results_df))], Section_results_df['Section'], fontweight='
plt.legend()

plt.show()
```



Section-wise Pass Percentage

```
In [23]: non_zero_pass_sections = Section_results_df[Section_results_df['Pass Percentage'] > 0]

labels = non_zero_pass_sections['Section']
sizes = non_zero_pass_sections['Pass Percentage']
colors = plt.cm.Paired.colors[:len(sizes)]

plt.figure(figsize=(8, 6))
plt.pie(
    sizes,
    labels=labels,
    autopct='%1.1f%%',
    startangle=140,
    colors=colors
)
plt.title('Section-wise Pass Percentage', fontweight='bold')
plt.axis('equal')

plt.show()
```


Section-wise Pass Percentage
C
A
B