Lab 10 - Task

Travelling on vacations to Romania

Problem:

Implement the best-first search algorithm on the map such that for any given city, it should return the shortest distance from that city to Bucharest using the heuristic based on best□first search algorithm

In [1]:

```
import networkx as nx
import matplotlib.pyplot as plt
from queue import PriorityQueue
```

In [2]:

```
G = nx.Graph()

G.add_nodes_from(["Arad", "Bucharest","Oradea","Zerind","Sibiu","Timisoara","Lugoj","Mah
```

In [3]:

```
edges = [("Arad", "Zerind", 75),("Arad", "Sibiu", 140),("Arad", "Timisoara", 118),("Buch
("Hirsova", "Urziceni", 98),("Iasi", "Neamt", 87),("Iasi", "Vaslui", 92),("Lugoj", "Meha

for edge in edges:
    G.add_edge(edge[0], edge[1], weight=edge[2])
```

In [4]:

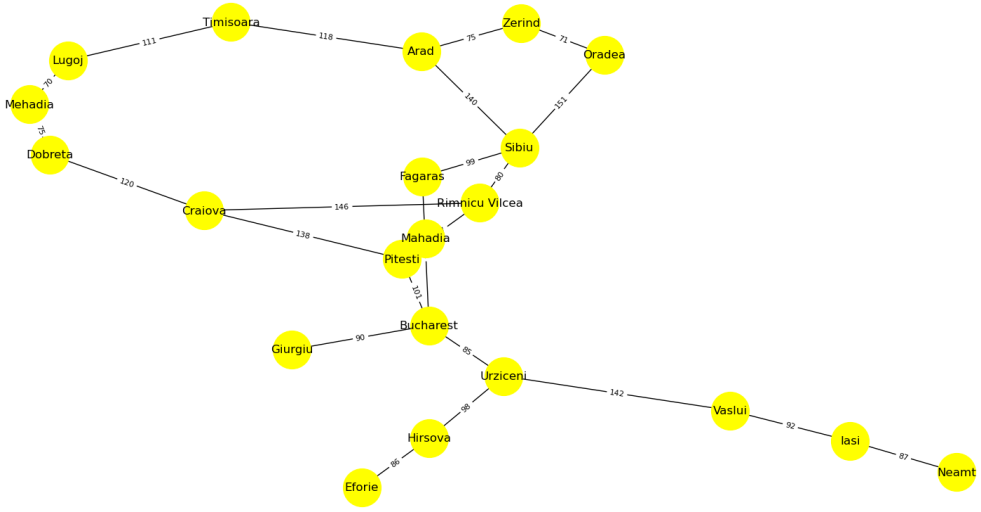
```
# Set node positions using Kamada-Kawai layout
pos = nx.kamada_kawai_layout(G)
```

In [5]:

```
# Draw graph with labels and edge weights
plt.figure(figsize=(16, 8))
nx.draw(G, pos, with_labels=True, font_size=12, node_size= 1500, node_color ="yellow")

edge_labels = nx.get_edge_attributes(G, "weight")
nx.draw_networkx_edge_labels(G, pos, edge_labels=edge_labels, font_size=8)

plt.show()
```



In [10]:

```
Heuristic_Values = {"Arad" : 366, "Bucharest":0,"Oradea":380,"Zerind":374,"Sibiu":253,"T

Heuristic_Values
```

Out[10]:

```
{'Arad': 366,
 'Bucharest': 0,
 'Oradea': 380,
 'Zerind': 374,
 'Sibiu': 253,
 'Timisoara': 329,
 'Lugoj': 244,
 'Mahadia': 241,
 'Dobreta': 242,
 'Rimnicu Vilcea': 193,
 'Craiova': 160,
 'Pitesti': 100,
 'Fagaras': 176,
 'Giurgiu': 77,
 'Urziceni': 80,
 'Hirsova': 151,
 'Eforie': 161,
 'Vaslui': 199,
 'Iasi': 226,
 'Neamt': 234}
```

In [11]:

```
PQ = PriorityQueue()

starting = "Arad"
goal = "Bucharest"

visited = []
closed = []

PQ.put((Heuristic_Values[starting],starting))

while PQ.empty() == False:

    n = PQ.get()

    h = n[0]
    city = n[1]

    closed.append(city)
    visited.append(city)

    successors = [i for i in G.neighbors( city)]

    if goal in successors:

        visited.append(goal)
        cost = nx.path_weight(G, visited, "weight")
        print("Goal city:", goal, "reached.")
        print("Visited cities:", visited)
        print("Cost = ", cost)
        break

    successor_queue = PriorityQueue()

    for i in successors:
        successor_queue.put((Heuristic_Values[i], i))

    for i in successors:
        s = successor_queue.get()
        if s not in closed and s not in visited:
            PQ.put(s)
            break
```

```
Goal city: Bucharest reached.
Visited cities: ['Arad', 'Sibiu', 'Fagaras', 'Bucharest']
Cost =  450
```

In [ ]: