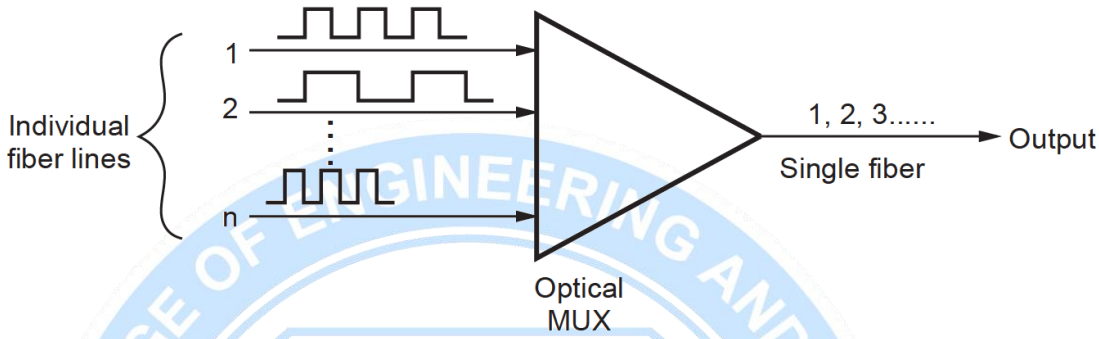
5.3 Wavelength Division Multiplexing (WDM)

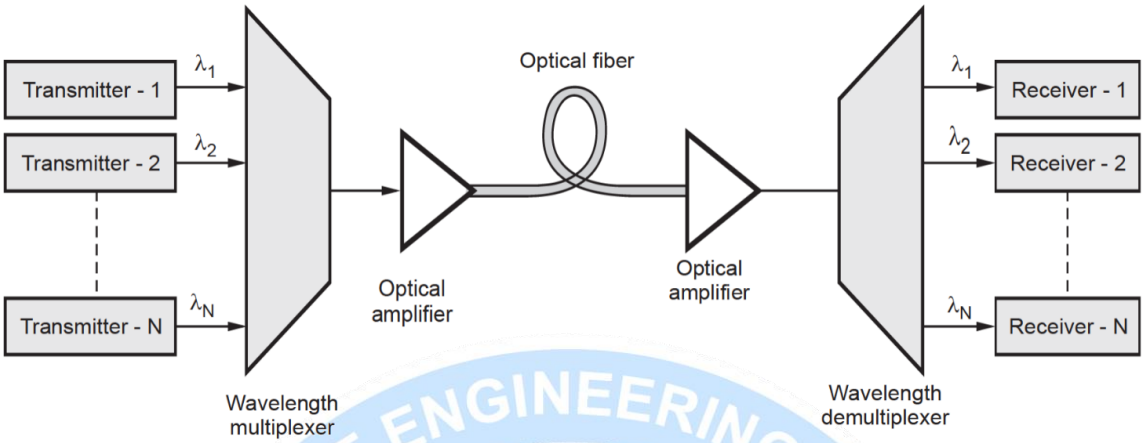
- Many different wavelengths between 1300 to 1600 nm can be sent over a fiber simultaneously.



- The technique of combining multiple wavelengths is called Wavelength Division Multiplexing (WDM). Figure illustrates the concept of WDM.
- Different fiber lines of different data rates and different wavelengths are combined by optical multiplexer. All these wavelengths are available at output.

WDM Scheme

- Optical signals of different wavelength (1300-1600 nm) can propagate without interfering with each other.
- The scheme of combining a number of wavelengths over a single fiber is called **Wavelength Division Multiplexing (WDM).**
- At the receiving station, an optical demultiplexer is required to separate the different carriers before photodetection of individual signals. Figure shows simple WDM scheme.
- To prevent spurious signals to enter into receiving channel, the demultiplexer must have narrow spectral operation with sharp wavelength cut-offs. The acceptable limit of crosstalk is - 30 dB.



Features of WDM

- **Important advantages or features of WDM are as mentioned below -**
    1. Capacity upgrade : Since each wavelength supports independent data rate in Gbps.
    2. Transparency : WDM can carry fast asynchronous, slow synchronous, synchronous analog and digital data.
    3. Wavelength routing : Link capacity and flexibility can be increased by usingmultiple wavelength
    4. Wavelength switching : WDM can add or drop multiplexers, cross connects and wavelength converters
- **Types of WDM**

The WDM implementation can be done in two types :

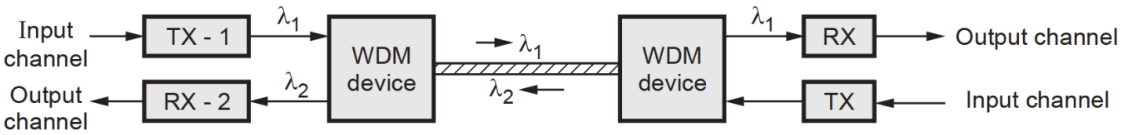
1. Unidirectional WDM
2. Bidirectional WDM

1. Unidirectional WDM

• A unidirectional WDM system is used to combine different source.

2. Bidirectional WDM

- In bidirectional WDM system, two or more wavelengths can be transmitted simultaneously in either directions over the same fiber.
- Figure illustrates bidirectional WDM.



Categories of WDM