SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

An Autonomous Institution

DEPARTMENT OF ELECTRONICS & COMMUNICATION

MICROWAVE ENGINEERING

ENGINEERING

IV YEAR/ VII SEMESTER

UNIT 5-OPTICAL NETWORKS

WDM-DWDM

WAVELENGTH & DENSE WAVELENGTH DIVISION MULTIPLEXING

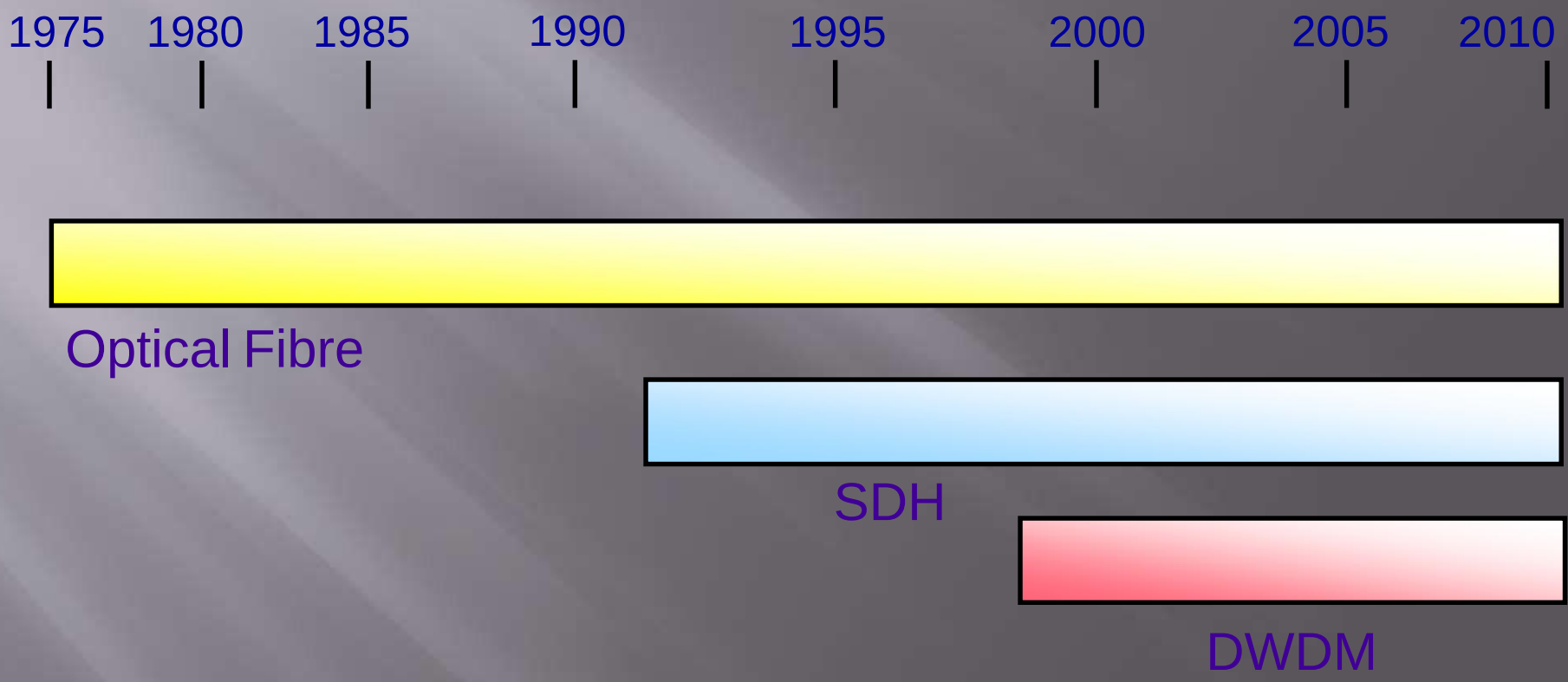
Introduction

- Multiplexing
- Wavelength Division Multiplexing (WDM)
  - Advantages
  - Disadvantages
- Dense Wavelength Division Multiplexing (DWDM)
  - Advantages
  - Disadvantages
- DWDM Standards
- Comparison between WDM and DWDM

Multiplexing

- Multiplexing
  - A process where multiple analog message signals or digital data streams are combined into one signal over a shared medium.
  - Types
  - Time division multiplexing.
  - Frequency division multiplexing.
  - Optically
  - Time division multiplexing.
  - Wavelength division multiplexing.

Timeline


1975
1980
1985
1990
1995
2000
2005
2010
Optical Fibre
SDH
DWDM

Wavelength Division Multiplexing

Wavelength Division Multiplexing

- Multiple channels of information carried over the same fiber, each using an individual wavelength.
- A communicates with X and B with Y as if a dedicated fiber is used for each signal.
- Typically one channel utilizes 1320 nm and the other 1550 nm.
- Broad channel spacing, several hundred nm.
- WDM is a way of transmitting more data by separating channels by "color".

Wavelength Division Multiplexing

1. Advantages:

- Fewer wires or channels to transmit and receive data.

- A single fiber-optic cable can handle dozens of channels, instead of using 12 cables, you only use 1 .

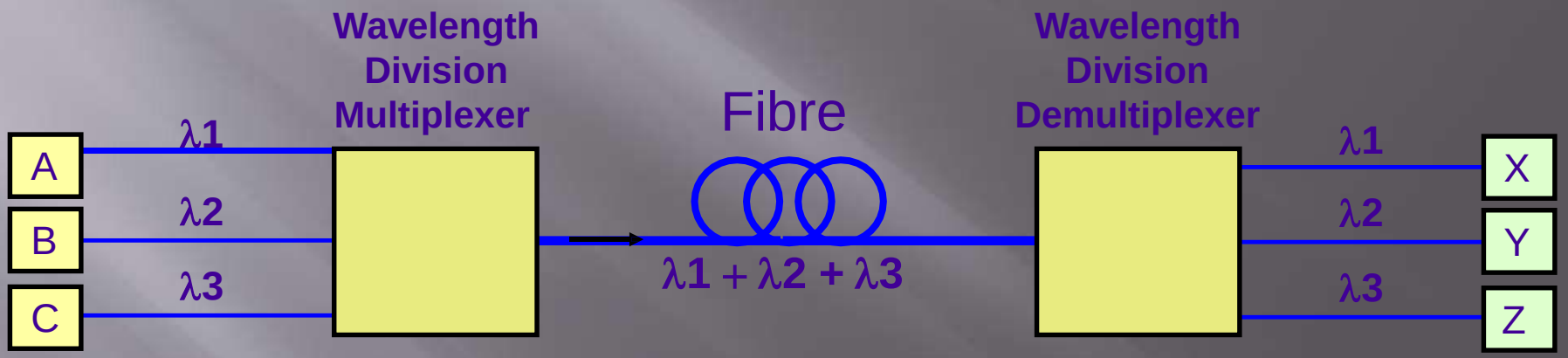
Wavelength Division Multiplexing

2. Disadvantages:

- Complex transmitters and receivers.

- They must be wide-band, which means they are more expensive and possibly less reliable.

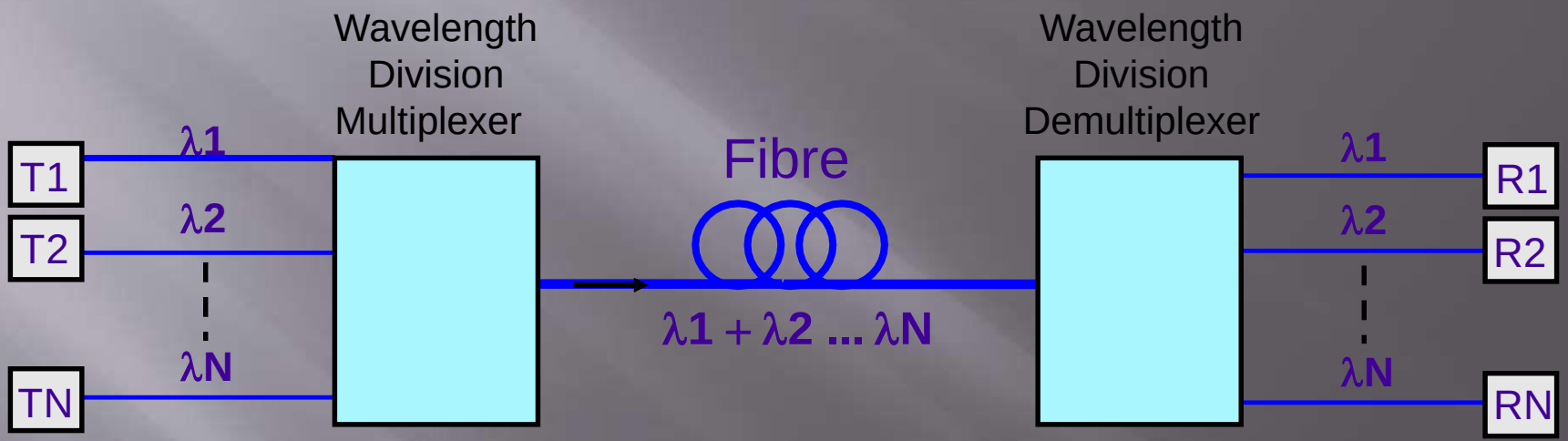
Dense Wavelength Division Multiplexing



Dense Wavelength Division Multiplexing

- Multiple channels of information carried over the same fiber, each using an individual wavelength.
- Dense WDM is WDM utilizing closely spaced channels.
- Channel spacing reduced to 1.6 nm and less .
- Cost effective way of increasing capacity without replacing fiber.
- Commercial systems available with capacities of 32 channels and upwards; > 80 Gb/s per fiber.

Dense Wavelength Division Multiplexing



Dense Wavelength Division Multiplexing

- Multiple channels of information carried over the same fiber, each using an individual wavelength.
- Unlike WDM channels are much closer together.
- Transmitter T1 communicates with Receiver R1 as if connected by a dedicated fiber as does T2 and R2 and so on.

Dense Wavelength Division Multiplexing

1. Advantages:

- Greater fiber capacity.
- Easier network expansion.
- DWDM can give increases in capacity which TDM cannot match.
- Incremental cost for a new channel is low.

Dense Wavelength Division Multiplexing

2. Disadvantages:

- Not cost-effective for low channel numbers.
- Introduces another element, the frequency domain, to network design and management.
- SONET/SDH network management systems not well equipped to handle DWDM topologies.
- DWDM performance monitoring and protection methodologies developing.

Dense Wavelength Division Multiplexing Standards

- ITU Recommendation is G.692 "Optical interfaces for multichannel systems with optical amplifiers".
- G.692 includes a number of DWDM channel plans.
- Channel separation set at:
  - 50, 100 and 200 GHz .
  - Equivalent to approximate wavelength spacings of 0.4, 0.8 and 1.6 nm.
- Channels lie in the range 1530.3 nm to 1567.1 nm (so-called C-Band).
- Newer "L-Band" exists from about 1570 nm to 1620 nm.

Comparison between WDM & DWDM

	WDM	DWDM
Channel Spacing	1310 nm lasers used in conjunction with 1550 nm lasers	Small 200GHz and Small
Number of Bands Used	O and C	C and L
Cost per Channel	Low	High
Number of Channels Delivered	2	Hundreds of Channels Possible
Best Application	PON	Long-haul

Thank You……