NIRMA UNIVERSITY
SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY
B.Tech. Electronics & Communication Engineering
Semester - VI
Department Elective II

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Course Code	**2ECDE03**
Course Title	**Optical Devices and Networks**

Course Outcomes (COs):
At the end of the course, the students will be able to
1. Comprehend the principles and operations of different WDM networking components and elements.
2. Comprehend WDM Network architectures and analyse different issues in WDM Networks.
3. Analyse RWA problem and RWA algorithms.
4. Analyse requirements and structure of optical packet switching and optical access networks.

Syllabus: **Teaching Hours:45**

UNIT I: Introduction to Optical Networks   **02**
Evolution, Challenges, Overview Optical layer, Transparency and all-optical networks, Transmission basics

UNIT II: System Components   **10**
Couplers, Isolators & Circulators, Multiplexers & Filters, optical amplifiers, Transmitters, Detectors and Receivers, Optical switches, Wavelength Converters.

UNIT III: WDM Optical Networks   **09**
WDM Network architectures, RWA problem, Wavelength continuous and convertible networks, Multi-fiber networks, Wavelength rerouting, Virtual topology design and reconfiguration, Traffic grooming, Optical multicasting, Survivable networks, Network control and management, Optical access networks.

UNIT IV: Wavelength Routing Algorithms   **06**
Classification of RWA algorithms – Route and wavelength selection algorithms, RWA algorithms – fixed routing, fixed alternate routing, exhaust routing, least congested path routing, joint wavelength-route selection, fairness and admission control

UNIT V: WDM Network Elements   **06**
WDM network elements – optical line terminals, optical line amplifiers, optical Add-drop multiplexers, Optical Cross-connects

UNIT VI: Photonic Packet Switching   **06**
Optical time-division multiplexing, Synchronization, Header processing, Buffering, Optical burst Switching.

UNIT VII: Optical Access Networks   **06**
Network architecture overview, Enhanced HFC, Passive Optical networks, Optical access network standards

Self-Study:
The self-study content will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study content.

Assignments:
The students will be given 8- 10 programming/simulation/projects assignments based on the above syllabus as mentioned below

   i.   Coherent optical communication systems, such as PM-QPSK, PM-BPSK,
   ii. DWDM/CWDM system

iii.   Optical amplification, such as EDFA, Raman, SOA, OPA

iv.   FTTx/PON, including BPON, G(E)PON, WDM-PON, coherent PON,

v.   Analog and digital CATV, radio-over-fiber, and microwave photonic links

vi.   OCDMA/OTDM

vii.   Electronic Dispersion Compensation (EDC)

viii.   Free Space Optics (FSO)

ix.   Optical interconnects

x.   Mini Project

Suggested Readings:

1. R. Ramaswami and K. Sivarajan, Optical Networks: A Practical Perspective, Elsevier
2. C. Siva Ram Murthy and M. Gurusamy, WDM Optical Networks, PHI