

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
EXC7054	Optical Fiber Communication	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme								
		Theory Marks					Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam					
		Test 1	Test 2	Ave. Of Test 1 and Test 2						
EXC7054	Optical Fiber Communication	20	20	20	80	-	-	-	100	

**Pre requisites:**

- EXC503: Electromagnetic Engineering
- EXC405: Fundamentals of Communication Engineering
- EXC505: Digital Communication.

**Course Objective: To teach students**

1. Optical fiber wave guide structures, fabrication and signal degradation in fiber
2. The characteristics and working of various components used in optical link
3. Design and management of optical networks

**Course Outcome: After successful completion of the course student will be able to**

1. understand light wave propagation through fiber
2. identify structures, materials, and components used in optical link
3. analyze transmission characteristics of fiber
4. design and management of optical fiber links

<b>Module No.</b>	<b>Unit No.</b>	<b>Topics</b>	<b>Hrs.</b>
<b>1.</b>		<b>Overview of Optical Fiber Communication</b>	<b>10</b>
	<b>1.1</b>	The evolution of fiber optic systems, elements of an optical fiber transmission link, block diagram, advantages of optical fiber communication, applications	
	<b>1.2</b>	Ray theory transmission, total internal reflection, acceptance angle, numerical aperture and skew rays	
	<b>1.3</b>	Modes, electromagnetic mode theory and propagation, single mode and multimode fibers, linearly polarized modes	
	<b>1.4</b>	Fiber material, fiber cables and fiber fabrication, fiber joints, fiber connectors, splicer	
<b>2</b>		<b>Optical Sources and Detectors</b>	<b>10</b>
	<b>2.1</b>	Coherent and non-coherent sources, quantum efficiency, modulation capability of optical sources	
	<b>2.2</b>	LEDs: Working principle and characteristics	
	<b>2.3</b>	Laser diodes: Working principle and characteristics	
	<b>2.4</b>	Working principle and characteristics of detectors: PIN and APD, noise analysis in detectors, coherent and non-coherent detection, receiver structure, bit error rate of optical receivers, and receiver performance	
<b>3</b>		<b>Components of Optical Fiber Networks</b>	<b>08</b>
	<b>3.1</b>	Overview of fiber optic networks, trans-receiver, semiconductor optical amplifiers	
	<b>3.2</b>	Couplers/splicer, wavelength division multiplexers and de-multiplexers	
	<b>3.3</b>	Filters, isolators and optical switches	
<b>4</b>		<b>Transmission Characteristic of Optical Fiber</b>	<b>08</b>
	<b>4.1</b>	Attenuation, absorption, linear and nonlinear scattering losses, bending losses, modal dispersion, waveguide dispersion and pulse broadening,	
	<b>4.2</b>	Dispersion shifted and dispersion flattened fibers, and non linear effects	
	<b>4.3</b>	Measurement of optical parameters, attenuation and dispersion, OTDR	
<b>5</b>		<b>Optical Networks</b>	<b>08</b>
	<b>5.1</b>	SONET and SDH standards, architecture of optical transport networks (OTNs), network topologies	
	<b>5.2</b>	Operational principle of WDM, WDM network elements and Architectures, Introduction to DWDM, Solitons.	
<b>6</b>		<b>Network Design and Management</b>	<b>08</b>
	<b>6.1</b>	Point to point links system considerations, link power budget, and rise time budget	
	<b>6.2</b>	Transmission system model, power penalty-transmitter, receiver optical amplifiers, crosstalk, dispersion, wavelength stabilization.	
	<b>6.3</b>	Network management functions, configuration management, performance management, fault management, optical safety and service interface	
<b>Total</b>			<b>52</b>

### **Recommended Books:**

1. John M. Senior, “*Optical Fiber Communication*”, Prentice Hall of India Publication, Chicago, 3<sup>rd</sup> Edition, 2013
2. Gred Keiser, “*Optical Fiber Communication*”, Mc-Graw Hill Publication , Singapore, 4<sup>th</sup> Edition, 2012
3. G Agarwal, “*Fiber Optic Communication Systems*”, John Wiley and Sons, 3<sup>rd</sup> Edition, New York 2014
4. S.C. Gupta, “*Optoelectronic Devices and Systems*”, Prentice Hall of India Publication, Chicago, 2005.

### **Internal Assessment (IA):**

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the test will be considered as final IA marks

### **End Semester Examination:**

1. Question paper will comprise of 6 questions, each of 20 marks.
2. Total 4 questions need to be solved.
3. Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4. Remaining question will be selected from all the modules.