



**INSTRUCTION DIVISION**  
**FIRST SEMESTER 2020-2021**  
**Course Handout Part II**

**Date:17/08/2020**

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

**Course No.** : **EEE G591**  
**Course Title** : **Optical Communication**  
**Instructors** : **V.K. CHAUBEY, Rahul Singhal**

1. **Course Description** : Basic concepts of optical Communication systems, linear and non-linear optical fibre characteristics, optical sources and transmitters (design, performance), modulator (direct/indirect), optical coupling/distribution, optical amplifiers, coherent light wave system, long-haul and distribution optical communication systems, WDM & TDM light wave system, soliton based communication system and new advance in optical communication.
2. **Scope and objective of the course** :

This course is intended for a specialized degree of communication engineering/Science students at senior levels. This course covers a detailed discussion on optical communication concepts, components, system and applications. The goal of this course is to enhance the basics and concepts of optical communication system design.

2. **Text Book** : Govind P. Agrawal, "Fiber-optic Communication Systems" Third Edition, John Wiley 2002.
3. **Reference Books** :  
R1: John Powers, "An Introduction to Fiber Optic Systems" 2<sup>nd</sup> Ed., IRWIN, 1997.  
R2: Robert M. Gagliardi & S. Karp, "Optical Communications" John Wiley & Sons NC, 1995.  
R3: Rajiv Ramaswami, Kumar N. Sivarajan, "Optical Networks- A Practical Perspective", Morgan Kaufmann Pub. Second Ed., 2004.  
R4: Djafar K. Mynbaev & Lowell L Scheiner "Fiber – Optic Communications" Person Asia, First Indian Reprint, 2001.

4. **Course Plan** :

L No.	Topics/Module	Learning Outcome	Ref*.Chap/ Sec./ (Book)
1.	Concept of field propagation in optical fibres	Optical Confinement, cutoff condition, single mode/multimode concept.	2(T)
2.	Concept of field absorption, scattering, loss	Fibre loss, linear scattering	2(T)
3.	Concept of pulse broadening and bandwidth limitation	Dispersion in fibres	2(T)
4.	Concept of dispersion reduction and B.L	Zero dispersion concepts, DSF,	Class discussions Ch.3





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	optimization.	DFF	(R2)
5.	Non linear effects in optical fibres	SRS,SBS,SPM,XPM,FWM	Class, 3.4 (R1)
6.	Concepts of dispersion compensation	Dispersion management, FWM Tech.	3.3 (R2)
7.	Concept of semiconductor sources	LED & ILD	5.3 (R1), 3 (T)
8.	Concepts of optical gain	Laser modes, laser action, mode selection	3(T),9.2 (R4)
9.	Concept of high speed S.C lasers	Chirping control, mode selection	Class, 6.6 (R2)
10.	Concept of Electro-Optic effect	Pockel effect & Kerr effect based devices	17 (R3)
11.	Concept of Acousto-Optic effect	Raman & Bragg modulators, deflectors	17 (R3)
12.	Concepts of Transmitter design.	Coherent light wave Transmitters	Class, 10 (R4)
13.	Concept of performance issues of transmitters	Reliability, Testing, chirping and performance study	Class notes
14.	Concept of photo detection	PIN,APD, MSM.	6(R1),4(T)
15.	Concept of optical receiver	Receiver design, S/N Estimation, Digital optical receivers	10(T) Class
16.	Do	Digital receiver sensitivity (Coherent receivers)	6.3-6.4(R1) 10(T)
17.	Concept of receivers performance	Design issues, S/N and BER optimization.	10(T),6.4, 6.5 (R1)
18.	Concept of receivers overview	Practical receiver discussion	Class,11 (R4),10(T)
19.	Concept of Semiconductor laser amplifier	SLA,	6(T)
20.	Concept of active fibre amplifiers	SRA, SBS	6(T)
21.	Concepts of Doped fibre amplifiers	EDFA	6(T), Class notes
22.	Concept of light wave amplifier systems.	Design and application of amplifiers	Ch.6 (T)
23.	Concept of light wave communication systems	Design issues of communication systems	Class
24.	Concept of design Power penalty	Power penalty estimation and reduction approaches.	5.4 (T)
25.	Concept and design guide-lines for optical link	Power penalty considerations and link budget.	5.4 (T)
26.	Concept of optical network and system architectures	Different topologies used in optical network	8 (R1),6(R3)
27.	Concept of Optical Networks	Optical LAN , WANS,	8 (R1),6(R3)



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		SONET/SDH	
28.	Concept WDM light wave system	Channel spacing decision, multipliers, design issues	8(T)
29.	Concept of WDM system components	couplers/routers/switches	8(T)
30.	Do	Optical filters	Class, (T) 13 (R4)
31.	Concepts of WDM Transmitters/Receivers	Practical Transmitters /Receivers	Class,12.2 (R4)
32.	Concept of WDM system performance	Linear and Non linear effects	8(T)
33-35	Concepts of WDM Networking	WDM Network routing/management	8(R3)
36	Concept of time division multiplying	Optical TDM techniques.	7.4 (R1)
37	Concept of soliton communication	Soliton Generation	19 (R2), 9(T) 7.10 (T)
38	Do	Soliton Interaction	9(T)
39	Do	High capacity soliton systems and jitter reduction	9(T)
40	Concept of WDM soliton system	Soliton Multiplexing techniques	Class notes
41	To learn new development in optical communication	New trends in optical communication	R3,Class notes
42	Do	Networking, communication	R3,Class notes
<b>Total No. of Lectures ( 42 )</b>			

### 4. Evaluation Scheme :

Component	Duration	Weightage(%)	Date & Time	Remarks
Test 1	30 mins	10		OB
Test 2	30 mins	10		OB
Test 3	30 mins	10		OB
Surprise Quiz	5 mins	20		CB
Assignment/lab		15		OB
Compre	3 hrs	35		OB/CB

5. **Chamber Consultation Hours:** To be announced in the class.

6. **Make-up Policy:** Make-up will be given on genuine cases. Prior application should be made for seeking the make-up examination.

7. **Notices :** Notices Concerning the course will be displayed on EEE Notice Board only.

Instructor-in-charge  
EEE G591



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