**NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

| COURSE PLAN – PART I | | | |
|---|---|---|---|
| **Name of the programme and specialization** | **M.Tech - Communication Systems** | | |
| **Course Title** | **FIBER OPTICS AND COMMUNICATION LABORATORY** | | |
| **Course Code** | **EC608** | **No. of Credits** | **02** |
| **Course Code of Pre-requisite subject(s)** | **None** | | |
| **Session** | ~~July~~ **/ January 2021** | **Section (if, applicable)** | **A / B** |
| **Name of Faculty** | **Dr. R. K. JEYACHITRA** | **Department** | **Electronics and Communication Engineering** |
| **Official Email** | **jeyachitra@nitt.edu** | **Telephone No.** | **0431 2503320** |
| **Name of Course Coordinator(s) (**if, applicable**)** | **---** | | |
| **Official E-mail** | **---** | **Telephone No.** | **---** |
| **Course Type** (please tick appropriately) | ✓ **Core course** | -- **Elective course** | |

| | | | |
|---|---|---|---|

**Syllabus (approved in BoS)**

**List of Experiments**

1. Measurement of Numerical Aperture

2. Measurement of Attenuation and Bending Loss in Multimode Glass Fiber

3. Study of BER and Q-factor Measurement

4. Characterization of Erbium Doped Fiber Amplifier

5. a. Study of Wavelength Division Multiplexing Links

   b. Study of Four Wave Mixing Fiber Non-linearity

6. Study the Characteristics of AWGN and BSC channels

7. Study of Digital Modulation Schemes

   a. BPSK Modulator and Demodulator

   b. 16-Quadrature Amplitude Modulator and Demodulator

8. Study of Error Control Codes

   a. Convolutional Encoder and Decoder

   b. Cyclic Encoder and Decoder

9. Study of Path Loss in Wireless Propagation Models
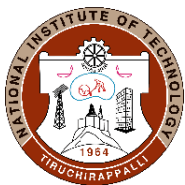
10. Study of Rayleigh and Rician Fading channels

11. Orthogonal Frequency Division Multiplexing (OFDM) 802.11a

**Reference:** LAB Manuals and Supplier manuals are distributed among students.

## COURSE OBJECTIVES

- To prepare the students understand the various process and subsystems involved in the optics and communication systems.
- To enable the students, gain the knowledge of different encoding and multiplexing technologies in the fiber optics and wireless communication systems.
- To design optics and communication systems to serve a defined purpose.

## MAPPING OF COs with POs

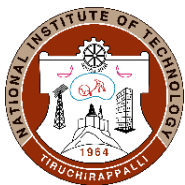| Course Outcomes | Programme Outcomes (PO) (Enter Numbers only) |
|---|---|
| **At the end of the course student will be able to** | |
| 1. Understand the basic concepts and advancements in fiber optic technology and wireless communication systems | PO1, PO2, PO3, PO5, PO6, PO8, PO9 |
| 2. Understand the channel characteristics of fiber optics and wireless communication systems and the concept of the optical amplifier | PO1, PO2, PO5, PO10 |
| 3. Demonstrate the digital modulation schemes and error control coding techniques | PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO10 |
| 4. Interpret the fiber optic and wireless communication system models by using the simulation software | PO1, PO2, PO3, PO5, PO6, PO7, PO8, PO10, PO11 |
| 5. Analyze the operating principle of WDM solutions systems and effect of non-linearity in optical fiber | PO1, PO2, PO5, PO10 |

## COURSE PLAN – PART II

### COURSE OVERVIEW

Students get exposure to the fundamentals and advance level of optical and communication systems. Course includes series of hardware and software experiments which provide hands-on- experience needed to master the basic concepts and laboratory techniques of fiber optics and communication technologies. Students acqurie the knowledge of enabling modules and models in wireless communication systems. The lab is well equiped with computers, optical simulation softwares (such as OPTSIM and PHOTONICS CAD), communication simulation software (such as COMMSIM and MATLAB) to support strong academic and research activity in the area.

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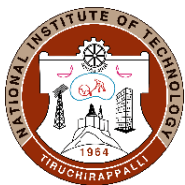
| S.No. | Week/Contact Hours | Topic | Mode of Delivery |
|---|---|---|---|
| COURSE TEACHING AND LEARNING ACTIVITIES | | | (Add more rows) |
| 1 | I WEEK | Instruction class | PPT- Online |
| 2 | II WEEK | Measurement of Numerical Aperture | LAB EXERCISE - ONLINE |
| 3 | III WEEK | Measurement of Attenuation and Bending Loss | |
| 4 | IV WEEK | Study of BER and Q-factor Measurement | |
| 5 | V WEEK | Characterization of Erbium Doped Fiber Amplifier | LAB EXERCISE - ONLINE |
| 6 | VI WEEK | Study of Wavelength Division Multiplexing Links<br>Study of Four Wave Mixing Fiber Non-linearity | |
| 7 | VII WEEK | Study the Characteristics of AWGN and BSC channels | |
| 8 | VIII WEEK | Study of Digital Modulation Schemes<br>a. BPSK Modulator and Demodulator<br>b. 16-Quadrature Amplitude Modulator and Demodulator | |
| 9 | IX WEEK | Study of Error Control Codes<br>a. Convolutional Encoder and Decoder<br>b. Cyclic Encoder and Decoder | |
| 10 | X WEEK | Study of Rayleigh and Rician Fading channels | |
| 11 | XI WEEK | Orthogonal Frequency Division Multiplexing (OFDM) 802.11a | |
| 12 | XII WEEK | Compensation Lab Session | |
| END SEMESTER EXAMINATION | | | LAB EXERCISE |

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| COURSE ASSESSMENT METHODS (shall range from 4 to 6) | | | | |
|---|---|---|---|---|
| S.No. | Mode of Assessment | Week/Date | Duration | % Weightage |
| 1 | LAB PREPAREDNESS | Entire course duration | - | 20 |
| 2 | CONTINUOUS EVALUATION / RECORD | Entire course duration | - | 20 |
| 3 | VIVA VOCE (WRITTEN TEST) | One week prior to the end semester | 45 Minutes | 30 |
| 4 | END SEMESTER EVALUATION * | End of semester | 120 Minutes | 30 |

**\*mandatory; refer to guidelines on page 5**

**COURSE EXIT SURVEY** (mention the ways in which the feedback about the course shall be assessed**)**

- Feedback from the students during class committee meetings.
- Individual Subject feedback through MIS website at the end of the semester.

**COURSE POLICY (**including compensation assessment to be specified**)**

**MODE OF CORRESPONDENCE (email/ phone etc.)**

1. All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes/ schedule of assessment/ course material/ any other information regarding this course) will be done through their webmail only.

2. Queries (if required) to the course teacher shall only be emailed to the email id specified by the teacher.

**ASSESSMENT**

1. Attending all the assessments is MANDATORY for every student.

2. Finally, every student is expected to score a minimum mark as per the regulations of the institute out of the total assessments (1, 2, 3 and 4) to pass the course. Otherwise the student would be declared fail and 'F' grade will be awarded.

**ATTENDANCE POLICY** (A uniform attendance policy as specified below shall be followed)

➢ At least 75% attendance in each course is mandatory.

➢ A maximum of 10% shall be allowed under On Duty (OD) category.

➢ Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

**ACADEMIC DISHONESTY & PLAGIARISM**

➢ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
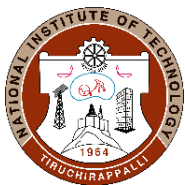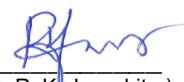
> ➢ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.

> ➢ The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

> ➢ The above policy against academic dishonesty shall be applicable for all the programmes.

**ADDITIONAL INFORMATION**

The faculty is available for consultation at times as per the intimation given by the faculty.

**FOR APPROVAL**

**Course Faculty** _____  **CC-Chairperson** _____  **HOD** _____
(Dr.R. K. Jeyachitra)

## Guidelines:

a) The number of assessments for any theory course shall range from 4 to 6.

b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.

c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.

d) The passing minimum shall be as per the regulations.

| B.Tech. Admitted in | | | | P.G. |
|---|---|---|---|---|
| **2018** | **2017** | **2016** | **2015** | |
| 35% or (Class average/2) whichever is greater. | | (Peak/3) or (Class Average/2) whichever is lower | | 40% |

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.