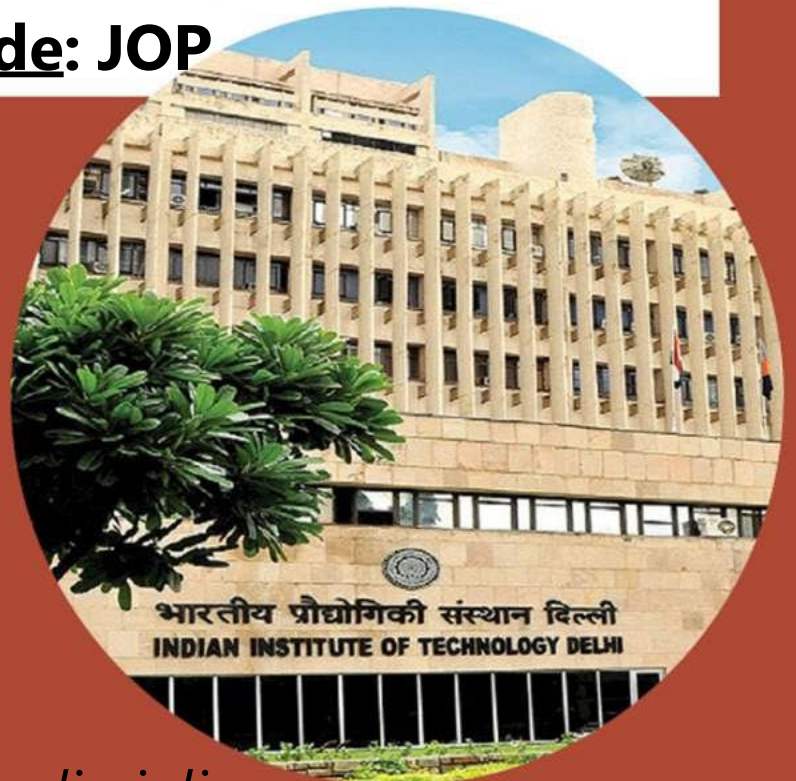
Master of Technology in Optoelectronics and Optical Communication

Program code: JOP



An interdisciplinary program

Department of *Physics*

&

Department of *Electrical Engineering*

Program & Project Coordinators

Amartya Sengupta(**Physics**)

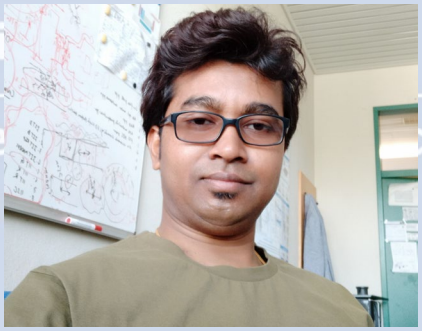
amartya@physics.iitd.ac.in

Tel: (91)-11-2659-1382
Mobile: + 91 9582733597
https://web.iitd.ac.in/~amartya/

Research Interests:
Ultrafast Optics, THz and Raman Imaging and Spectroscopy, Semiconductor Quantum Heterostructures and Optoelectronics

JOP 2025-27 batch
WhatsApp group

Santanu Manna (**EE**)



mannasan@ee.iitd.ac.in

Tel: (91)-11-2659-1029
http://web.iitd.ac.in/~mannasan

Research Interests:
Molecular Beam Epitaxy, processing, and measurements on III-V semiconductor based quantum devices like single/entangled photon emitter, quantum cascade laser-based frequency comb and THz emitters

Optoelectronics and Optical Communication is at the forefront of technological revolution in several key areas, that include telecommunication, sensing, lithography, material processing, displays, photovoltaics, microwave photonic chips, data storage, computing, artificial intelligence and quantum communication technologies.

This has created an ever-rising demand in such industries, that lead to a globally growing need for highly skilled personnel trained in these interdisciplinary fields.

JOP Program Website https://oeoc.iitd.ac.in/jop/index.php/

Department of Electrical Engineering

- Optical Communication System
- Digital Communication & Information System
- Advanced Digital Signal Processing
- Computer Communication Networks
- Broadband Communication Systems
- Access Networks
- Microwave Photonics
- MOS VLSI Design
- Hardware Modelling of Digital Systems
- Telecommunication Switching and Transmission
- Wireless Optical Communications
- Photonic Switching and Networking
- Optoelectronic Instrumentation
- Machine Learning

Department of Physics

- Fiber Optics
- Optical Electronics
- Photonics Devices
- Quantum Information and Computing
- Optics and Lasers
- Green Photonics
- Integrated Optics
- Fiber Optic Components and Devices
- Guided Wave Photonic Sensors
- Fourier Optics and Holography
- Ultra-fast Optics and Applications
- Biomedical optics and Bio-photonics
- Quantum Optics
- Nano-Photonics and Plasmonics

Curriculum

Department of Electrical Engineering & Department of Physics

M.Tech in Optoelectronics & Optical Communication

JOP Program Website: https://oeoc.iitd.ac.in/jop/index.php/course-structure/

Students graduating from this program will be able to:

PLO1 -- Explain fundamental physical and technical base of Optoelectronic systems

PLO2 – Describe and apply basic laws and phenomena that define behaviour of optoelectronic and fiber optics-based communication systems,

PLO3 -- Analyse various premises, approaches procedures and results related to optoelectronic and optical communication systems,

PLO4 -- Use optical fibre equipment, and data transfer using optical fiber.

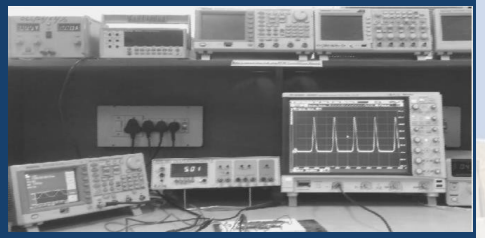
PLO5 -- Devise experiments and measurements in laboratory independently and as a team on real components, devices and equipment of optoelectronic systems,

PLO6 – Recall knowledge and be able to independently present various professional materials related to opto-electronics.

Lab Facilities

Optical Communication Lab

- Intensity Modulation/Direct Detection Optical Communication Link
- Error Control coding in Free Space Optics Link
- Dense Wavelength Division Multiplexing
- Optical Signal Processing
- Optical Spectrum Analyser
- Optical Time Domain Reflectometer
- Frequency Spectrum Analyser
- Dense WDM Kit (4 Channel)
- SDH Analyser



Fiber Optics Lab

- Refractive Index Profile Measurement
- Fiber and splice Loss Measurement
- Variable Optical attenuator
- Interferometer Gain Stabilization of EDFA
- Acousto-Optic Modulatotion Sensors
- based on Microbending Loss
- Temperature Sensor based on Fiber

Photonics Lab

- Gigabit capable Passive Optical Network (GPON)
- Radio Over Fiber (RoF)
- Visible Light Communication
- Free Space Optics
- Optical Fiber based Sensor
- Optical Frequency Comb

Student Fellowships in JOP & Foreign Universities/Industries/Projects

- IITD MTech. fellowship comes with TA duties to be fulfilled by ALL students.
- **DAAD fellowship** for research internship in Germany (wait for info. From Dean (Acad)'s office to all students) – for the batch topper(s)

Collaborations with Universities & Industries

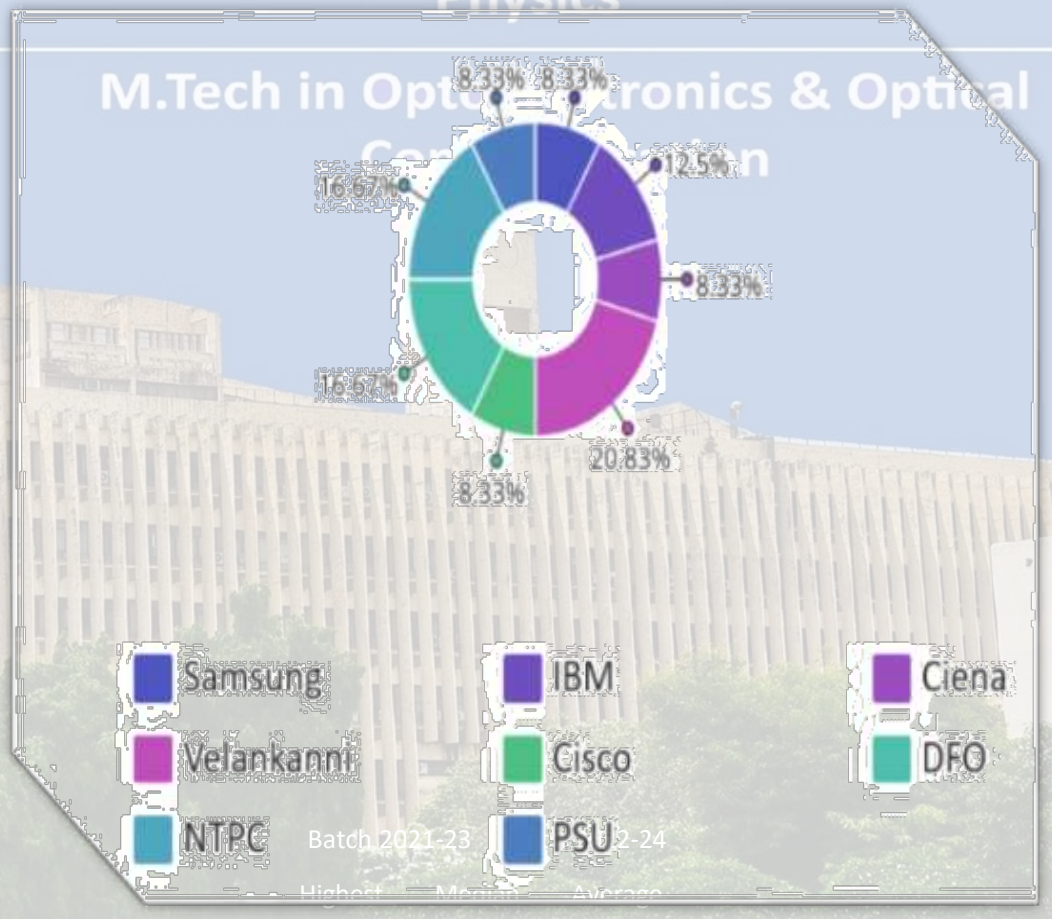
- Ghent University, Belgium
- University of Applied Sciences, Duesseldorf, Germany
- Heriot Watt University, Edinburgh, UK
- Russian Academy of Sciences, Russia
- University of Strathclyde, Glasgow, UK
- University of Nice, France
- TU Munchen, Germany
- Phillips University, Marburg, Germany
- University of Jeans Monnet, France

Placement Statistics

Placement 2023-24

- VLSI
- Optical Design
- Machine Learning
- IT/Consultancy
- Communications
- Higher Studies

Placement 2024-25



Top Recruiters

NVIDIA

NXP

cadence

IBM

Marabu

Mercedes-Benz

SIGNALCHIP

3rdi Technologies

HeroFinCorp.

SAMSUNG

Representative Student Projects (2024-26)

- FPGA-Based Implementation of Digital Filters
- FPGA Control for Free-Space Communication
- Neural Networks for Digital signal Processing.
- Microwave Photonics Radars
- Design and Modeling of Novel SERS Sensor Chips.
- Optical frequency comb technology
- Reconfigurable Optical Filters

- Photonic Integrated Circuits and Hollow Core Optical Fibers
- Optical spectroscopic technique for cervical cancer detection using Artificial intelligence and Machine learning.
- THz spectral imaging for content extraction through layered structures.
- THz tomographic applications
- Quantum Communication
- Solid State full spectrum lighting

More Details: https://oeoc.iitd.ac.in/jop/index.php/students2024-26/

Lab Coordinators (JOP)

R.K. Varshney (**Physics**)

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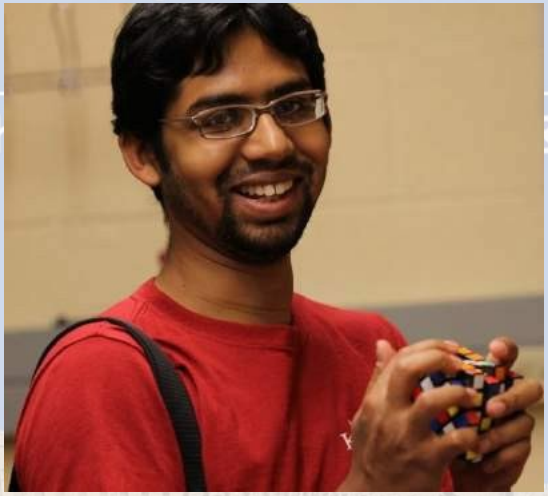
Indian Institute of Technology Delhi

Tel: (91)-11-2659-1357
https://oeoc.iitd.ac.in/jop/index.php/faculty/prof-r-k-varshney/

Research Interests:
Optical Fibre Communication, Integrated Optics

Vivek Venkataraman (**EE**)



vivekv@iitd.ac.in

Department of Electrical Engineering
Indian Institute of Technology Delhi

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https://sites.google.com/view/vivekv

Research Interests:
Nonlinear & quantum optics, fiber & integrated photonics, light-matter interaction & atomic physics, all-optical devices & novel light sources, optical signal processing & communication

Structure of Curriculum: https://oeoc.iitd.ac.in/jop/index.php/course-structure/

10. Number of Programme Core Credits (non-project)	19 (12 lecture credits + 6 lab credits + 1 for PESR course)
11. Number of Programme Elective Credits	24 (12 lecture credits + 12 project credits of Major Project - 2 OR 12 PE credits)
12. Number of Open Credits	6
13. Number of Project Core Credits	12 6 + 3 (cornerstone) + 3 (summer training) (Major Project -1)

TOTAL CREDITS: 61

Non-Graded Units: 24 Units of Teaching/Research Practicum (2nd, 3rd & 4th semesters)

Structure of Curriculum: https://oeoc.iitd.ac.in/jop/index.php/course-structure/

21. Nominal Semester-wise Academic Plan [Total Credits: 61]

Sem.	Courses (Number, Abbreviated Title, L-T-P, Credits)							Lecture courses	Contact hr/week L	T	P	Total	Credits
I	PYL7091 (3-0-0)3	ELL7027 (3-0-0)3	JOP7091 (0-0-6) 3	PYL7093 (3-0-0) 3	PYL/ELL PE-1 (3-0-0) 3		~~Teaching\ Research Practicum (0-0-8)~~	4	12	0	6	18	15
Winter	Cornerstone project, JOD7001 (0-0-4) 2							0	0	0	4	4	2
II	PYL/ELL PE-2 (3-0-0) 3	ELL7017 (3-0-0)3	JOP7092 (0-0-6) 3	PYL/ELL PE – 3 (3-0-0) 3	OE-1 (3-0-0) 3	JOD7001 (0-0-2) 1	Teaching\ Research Practicum (0-0-8)	4	12	0	8	20	16
Summer	Summer internship/Minor Project, JOT7002 (0-0-6) 3							0	0	0	6	6	3
III	JOD8001 (0-0-12) 6		PYL/ELL PE – 4 (3-0-0) 3	OE-2 (3-0-0) 3	VEV739 (0-0-2) 1		Teaching\ Research Practicum (0-0-8)	3	6	0	14	20	13
IV	JOD8002 (0-0-24) 12 OR						Teaching\ Research Practicum (0-0-8)	0	0	0	24	24	12
	PYL/ELL PE-5 (3-0-0) 3	PYL/ELL PE-6 (3-0-0) 3	PYL/ELL PE-7 (3-0-0) 3	PYL/ELL PE-8 (3-0-0) 3				4	12	0	0	12	12
											Total		61

TOTAL = 61 Credits

[1] Minimum Grade of B required in JOD8001 to be able to register for JOD8002.

Important points to note about Lab Courses

- **Two Lab courses in the JOP program**: Labs **JOP7091** and **JOP 7092** Labs are conducted in semesters 1 and 2, respectively.

- Physics - **Fiber Optics Lab:** conducted by **Physics Dept.** (**RK Varshney** is the Coordinator)
- EE - **Optical Communication Lab:** conducted by **EE Department** (**Vivek Venkataraman** is the Coordinator)

- All students have to do both JOP7091 and JOP 7092 Labs. The Lab coordinators will discuss and inform you about details of conduct, time slot, etc.

- All students need to **complete 15 credits in 1st Sem** (*at least FOUR* Theory courses: PC (2) + PE (2) and *ONE* lab course)

Please register for JOP7091 in this semester

Program Courses in 1st Semester

21. Nominal Semester-wise Academic Plan [Total Credits: 61]

Sem.	Courses (Number, Abbreviated Title, L-T-P, Credits)							Lecture courses	Contact hr/week				Credits
									L	T	P	Total	
I	PYL7091 (3-0-0)3	ELL7027 (3-0-0)3	JOP7091 (0-0-6) 3	PYL7093 (3-0-0) 3	PYL/ELL PE-1 (3-0-0) 3		Teaching Research Project (0-0-8)	4	12	0	6	18	15

- PYL 7091: FIBER OPTICS; RK Varshney, 'E' slot
- PYL 7093: PHOTONIC DEVICES; Amartya Sengupta, 'D'
- ELL 7027: DIGITAL COMM & INFORMATION SYSTEMS; Abhishek Dixit, 'F'
- PYL 7195: Optics and Laser Engineering; GV Prakash (EE entry), 'J'
- ELL 7028: Optoelectronic Instrumentation; Amol Choudhary (PHY entry), 'C'

Time-Table: https://timetable.iitd.ac.in/

Structure of Curriculum: https://oeoc.iitd.ac.in/jop/index.php/course-structure/

Program Courses in Winter..2nd Semester

Sem.	Courses (Number, Abbreviated Title, L-T-P, Credits)							Lecture courses	Contact hr/week				Credits
									L	T	P	Total	
Winter	Cornerstone project, JOD7001 (0-0-4) 2							0	0	0	4	4	2
II	PYL/ELL PE-2 (3-0-0) 3	ELL7017 (3-0-0)3	JOP7092 (0-0-6) 3	PYL/ELL PE – 3 (3-0-0) 3	OE-1 (3-0-0) 3	JOD7001 (0-0-2) 1	Teaching\ Research Practicum (0-0-8)	4	12	0	8	20	16

- ELL 7017: OPTICAL COMMUNICATION SYSTEMS
- JOP 7092: FIBER OPTICS/OPTICAL COMMUNICATION LAB
- JOD 7001: CORNERSTONE PROJECT
- PYL 7292: Optical and Quantum Electronics

Any 7000 OR 8000 level course from any AU within the Institute, which is not included in the PE basket of the JOP program

Structure of Curriculum: https://oeoc.iitd.ac.in/jop/index.php/course-structure/

PE Basket for JOP program (27 courses)

- ELL 7016: Telecommunication Switching & Transmission
- ELL 7020: Advanced Digital Signal Processing
- ELL 7023: Broadband Communication Systems
- ELL 7030: IC Technologies*
- ELL 7260: Nanophotonics and Plasmonics
- ELL 7390: Advanced Semiconductor Devices*
- ELL 7380: Micro and Nano Photonics*
- ELL 8140: Wireless Optical Communications
- ELL 8200: Photonic Switching and Networking

- PYL 7047: Non linear Optics*
- PYL 7049: Quantum Information and Computation
- PYL 7057: Statistical and Quantum Optics
- PYL 7060: Biomedical Optics and Biophotonics
- PYL 7070: Ultrafast Optics and Applications
- PYL 7090: Integrated Optics
- PYL 7292: Optical and Quantum Electronics
- PYL 8191: Fiber Optics Components and Devices
- PYL 8292: Guided Wave Photonic Sensors

Structure of Curriculum: https://oeoc.iitd.ac.in/jop/index.php/course-structure/

Program Courses in 3rd..4th semesters

Structure of Curriculum: https://oeoc.iitd.ac.in/jop/index.php/course-structure/

21. Nominal Semester-wise Academic Plan [Total Credits: 61]

Sem.	Courses (Number, Abbreviated Title, L-T-P, Credits)							Lecture courses	Contact hr/week				Credits
									L	T	P	Total	
I	PYL7091 (3-0-0)3	ELL7027 (3-0-0)3	JOP7091 (0-0-6) 3	PYL7093 (3-0-0) 3	PYL/ELL PE-1 (3-0-0) 3		Teaching\ Research Practicum (0-0-8)	4	12	0	6	18	15
Winter	Cornerstone project, JOD7001 (0-0-4) 2							0	0	0	4	4	2
II	PYL/ELL PE-2 (3-0-0) 3	ELL7017 (3-0-0)3	JOP7092 (0-0-6) 3	PYL/ELL PE – 3 (3-0-0) 3	OE-1 (3-0-0) 3	JOD7001 (0-0-2) 1	Teaching\ Research Practicum (0-0-8)	4	12	0	8	20	16
Summer	Summer internship/Minor Project, JOT7002 (0-0-6) 3							0	0	0	6	6	3
III	JOD8001 (0-0-12) 6		PYL/ELL PE – 4 (3-0-0) 3	OE-2 (3-0-0) 3	VEV739 (0-0-2) 1		Teaching\ Research Practicum (0-0-8)	3	6	0	14	20	13
IV	JOD8002 (0-0-24) 12 OR						Teaching\ Research Practicum (0-0-8)	0	0	0	24	24	12
	PYL/ELL PE-5 (3-0-0) 3	PYL/ELL PE-6 (3-0-0) 3	PYL/ELL PE-7 (3-0-0) 3	PYL/ELL PE-8 (3-0-0) 3				4	12	0	0	12	12
							Total						61

TOTAL = 61 Credits

JOP 2025-27 batch

WhatsApp group

- TIME-TABLE: https://timetable.iitd.ac.in/
- E-MAIL: https://webmail.iitd.ac.in/roundcube/
- MOODLE: https://moodle.iitd.ac.in/login/index.php
- ACADEMIC CALENDAR: https://home.iitd.ac.in/academic-calendar.php

WELCOME and ALL THE BEST

CLASSES BEGIN FROM THURSDAY, 24th JULY

PROGRAM WEBSITE: https://oeoc.iitd.ac.in/jop/