M.Tech. Program: Control and Automation (EEA)

Control Group
Department of Electrical Engineering
Indian Institute of Technology Delhi

Faculty Members

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Broad Research Areas

1. Systems Theory
   - Linear and Non-linear Control, Algebraic, Geometric, and Structural Control, Optimal Control, Stochastic Control and Estimation
2. Cyber-Physical Systems and Control
3. Robotics and Embedded Control
4. System Biology and Control
5. Learning Based Control
6. Robust & Optimal Control

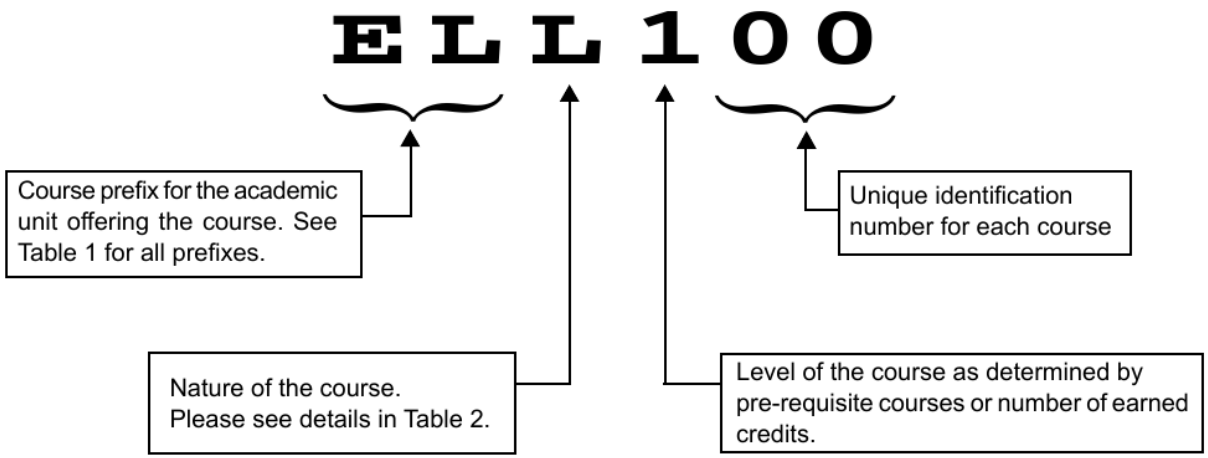
Research Areas and Relevant Courses

1. **Systems Theory**
   - ELL700: Linear System Theory
   - ELL702: Non-linear Systems
   - ELL703: Optimal Control
   - ELL705: Stochastic Filtering and Indentification
2. **Cyber-Physical Systems and Control**
   - ELL805: Network & Multi-Agent Control
   - ELL706: Optimization for Electrical Engineering
   - ELL795: Swarm Intelligence
3. **Robotics and Embedded Control**
   - ELL704: Advanced Robotics
   - ELL787: Embedded Systems & Application
4. **System Biology and Control**
   - ELL707: System Biology
   - ELL796: Signal and Systems in Biology
5. **Learning Based Control**
   - ELL802: Adaptive & Learning Control
   - ELL729: Stochastic Control and Reinforcement Learning

Relevant Websites

- For registration and other academic matters:
  `https://eacademics.iitd.ac.in/sportal/login`
- For any specific course related matters
  `https://moodle.iitd.ac.in/`
- For general matters: `https://internal.iitd.ac.in`
- For software/computer/network related issues:
  `https://www.cc.iitd.ac.in`
- Courses of study and Prospectus:
  `https://home.iitd.ac.in/curriculum.php`
- Register in required courses as soon as possible.
- Keep checking IITD email regularly (3-4 times in a day).

Course Numbering & Structure



(a) Codes for the nature of the course

Table 2: Codes for the nature of courses.

Code	Description
D	Project based courses (e.g. Major, Minor, Mini Projects)
L	Lecture courses (other than lecture hours, these courses can have Tutorial and Practical hours, e.g. L-T-P structures 3-0-0, 3-1-2, 3-0-2, 2-0-0, etc.)
N	Non-graded core component
P	Practical/Practice based courses (where performance is evaluated primarily on the basis of practice, practical or laboratory work with LTP structures such as 0-0-3, 0-0-4, 1-0-3, 0-1-3, etc.)
Q	Seminar Courses
R	Professional Practices
S	Independent Study
T	Practical Training
V	Lecture Courses on Special Topics (1 or 2 credits)

Course Numbering & Credit Structure

ELL225 *Control Engineering* 3-1-0-4 (L-T-P-C)

1. **L**: Lecture hours/week
2. **T**: Tutorial hours/week
3. **P**: Practical or Laboratory hours/week
4. **C**: Total Credits for the course
1. **Credit Evaluation**
    1. 3 Hours/week Lectures = 3 credits
    2. 1 Hour/week Tutorial = 1 credit
    3. 2 Hours/week Practical = $2 \times 0.5 = 1$ credit

Credit Structure for EEA Program

- Completing each course successfully earns a fixed number of credits (usually 3 or 4).
- Courses divided into:
  - Program Core (PC): Program specific compulsory course,
  - Program Elective (PE): Program relevant course, which needs to be chosen from a specific list
  - Open Elective (OE): Any courses, which are not PC
- To successfully complete M.Tech in EEA, courses worth 48 credits are required to be completed.

The overall credits structure

Category	PC	PE	OE	Total
Credits	24	18	6	48

Credit Structure for EEA Program

Sem.	Courses (Number, Abbreviated Title, L-T-P, Credits)					Lecture courses	Contact h/week				Credits
							L	T	P	Total	
I	ELL700 Linear Systems Theory (3-0-0)	ELL701 Mathematical Methods in Control (3-0-0)	ELL702 Nonlinear Systems (3-0-0)	ELP800 Control Systems Lab (0-0-2)	OE (3-0-0)	4	12	0	2	14	13
II	ELL703 Optimal Control Theory (3-0-0)	ELL705 Stochastic Filtering and Identification (3-0-0)	ELP801 Advanced Control Lab (0-0-4)	PE (3-0-0)		3	9	0	4	13	11
Summer											
III (Project based) OR	ELD801 Major Project Part-I (0-0-12)		PE (3-0-0)	OE (3-0-0)		2	6	0	12	18	12
III (Course based)	PE (3-0-0)	PE (3-0-0)	PE (3-0-0)	OE (3-0-0)		4	12	0	0	12	12
IV (Project based) OR	ELD802 Major Project Part-II (0-0-24)					0	0	0	24	24	12
IV (Course based)	ELD801 Major Project Part-I (0-0-12)		PE (3-0-0)	PE (3-0-0)		2	6	0	12	18	12

Total = 48

Slotting Pattern

Slot timings (General – 4 cycles)

Day	8-8.50	9-9.50	10-10.50	11-11.50	12-12.50	CYCLE NO.	1-1.50	2-2.50	3-3.50		4-4.50	5-5.50	6-6.50
Monday	A		B	H	J	1	TE1	AA			AB	M	
								PE1					
						2	TEF2	PE3					
						3	PB3		PC3				
						4	TA4	TD4	PD4			K	L
Tuesday	C	D	E	F	J	1	TA1	AC			AD		
								TD1	PD1				
						2	TE2	PE2					
						3	TF3	PF3					
						4	PB4		PC4				
Wednesday	C	D	E	H	K	1	L/TG1	L/TG2	INSTITUTE LEVEL SEMINARS/MEETINGS (NO REGULAR CLASSES)				
						2							
						3							
						4							
Thursday	A		B	F	H	1		AA			AB	M	
							PB1		PC1				
						2	TA2	TD2	PD2				
						3	TE3	PE3					
						4	TF4	PF4					
Friday	C	D	E	F	J	1	TF1	AC			AD	K	L
								PF1					
						2	PB2		PC2				
						3	TA3	TD3	PD3				
						4	TE4	PE4					

Note:

1. In the above table . for ex: TE1 means the “tutorials for E slot group 1”. Similarly PB3 means “ Lab for B slot group 3”
2. In some cases, the 3 Hr practical has been scheduled as 1 Hr followed by 2 Hr lab, as per the course requirement.
3. TG1 and TG2 are tutorial slots for courses that would like all groups to have tutorials in parallel.
4. Five cycle lab/Tutorials would vae lab/Tut also on Wednesdays between 1-5 PM.

Semester-I (13 credits)

- Program Core (PC) (10 credits)
  - ELL 700: Linear Systems (3 credits)
  - ELL 701: Mathematical Methods in Control (3 credits)
  - ELL 702: Non-linear Systems (3 credits)
  - ELP 800: Conrol Systems Lab (1 credit);
- One Open Elective (OE) (3 credits)
  - ELL 808: Advanced Topics in Systems and Control (3 Credits)
  - ELL 805: Networked and Multi-Agent Control Systems (3 Credits)
- Other courses can be found in courses of study.
- Carefully check if they are currently being offered on eacademics portal.

Semester II (11 credits)

Recommended course load of 4 courses.

- Program Core (8 credits)
  - ELL 703: Optimal Control Theory (credit 3)
  - ELL 705: Stochastic Filtering and Identification (credit 3)
  - ELP 801: Advanced Control Lab (credit 2)
- One Program Elective (PE) (3 credits)

Semester II (11 credits)

Recommended course load of 4 courses.

- Program Core (8 credits)
  - ELL 703: Optimal Control Theory (credit 3)
  - ELL 705: Stochastic Filtering and Identification (credit 3)
  - ELP 801: Advanced Control Lab (credit 2)
- One Program Elective (PE) (3 credits)
- One can take Minor Project (ELD800) in this semester as a PE.
- Minor project may help in setting solid background for doing good research work in major projects.

Choice from Sem III onwards

Two choices are available from this semester onwards! Once the choice is made, it needs to be followed for Sem III and Sem IV.

Semester III (12 credits)

1. **Choice 1:** ***Project based M.Tech.*** (12 credits)
   1. Program Core – ELD 801: M.Tech Project Part I (12 credits)
   2. One PE (3 credits)
   3. One OE (3 credits)
2. **Choice 2:** ***Course based M.Tech.*** (12 credits)
   1. Three PEs (9 credits)
   2. One OE (3 credits)

Which courses are running this semester?

- Linear Systems Theory (**C**, Prof. S. Janardhanan)
- Mathematical Methods in Control (**C**, Prof. S. Bhasin)
- Nonlinear Systems (**C**, Prof. P. Srivastava)
- Control Systems Lab (**C**, Prof. S. Datta)
- Systems Biology (**PE**, Prof. S. Sen)
- Advanced Topics in Systems and Control (**PE**, Prof. S. Datta)

Semester IV (12 credits)

1. **Choice 1:** ***Project based M.Tech.*** (12 credits)
   1. ELD 802: M.Tech Project Part II (12 credits)
2. **Choice 2:** ***Course based M.Tech.*** (12 credits)
   1. ELD 801: M.Tech. Project Part I (6 credits)
   2. Two PEs (6 credits)

Student Placements

1. Some of the organizations where our past students have placed
   - Intel
   - Bajaj Auto
   - GE
   - Morabu Hanshin
   - DRDO
   - NTPC
   - Mathworks
   - BEL
   - Delta Electronics
   - Dell
   - Conduent
   - Eaton
   - PWC (Price Water House Cooper)
   - Cadence
   - BARC
   - Lumenci

Thank You!