Scheme and Syllabus
of
M. Tech.
ECE (VLSI Design)
(2024-2025 onwards)

Offered by:

Department of Electronics & Communication Engineering

NATIONAL INSTITUTE OF TECHNOLOGY DELHI

Delhi-110036

(An autonomous Institute under the aegis of Ministry of Education, Govt. of India)

Department of Electronics and Communications Engineering
National Institute of Technology Delhi

1.1 About the Department

Welcome to the Department of Electronic and Communication Engineering (ECE), National Institute of Technology Delhi. It was established in 2010, immediately with the beginning of the Institute under the aegis of the Ministry of Human Resource and Development (MHRD), Govt. of India. Currently, Department is offering one Undergraduate Program as B. Tech (ECE) and two Postgraduate programs as M. Tech. ECE and M. Tech. ECE (VLSI). The Department also offers Ph.D. and Post-Doctoral Fellowship (PDF) Programme in relevant areas. It has excellent laboratories and research facilities in electronic devices and circuits, electronic measurement and instrumentation, microprocessor and microcontroller, microwave and antenna design, optical fiber communication and optical device, multimedia, and advanced communication and VLSI design automation and simulation laboratory. The Department has received projects, grants, and fellowships from the Ministry of Electronics and Information Technology (MeitY), the Department of Science and Technology (DST)-SERB, and other funding agencies. The Department has active collaborations with academic & research institutes in India and abroad.

The Department of ECE has a blend of young as well as experienced dynamic faculty members and is committed to providing quality education and research in the field. Faculty members of the department have excellent academic & research credentials and published numerous peer-reviewed journal articles/ papers, Books, Book Chapters, etc. in the diversified field and have adequate experience in advanced research. The department of ECE provides a creative learning environment to the students for excellence in technical education. Here the students learn to face the challenges related to emerging technologies in electronics and communication engineering. The department of ECE promotes a self- learning attitude, entrepreneurial skills, and professional ethics. The department hopes to achieve the national goals and objectives of industrialization and self-reliance. As a result, it hopes to produce post graduates with strong academic and practical backgrounds so that they can fit into the academia, research and industry.

1.2   Vision

Create an educational environment to prepare the students to meet the challenges of the modern electronics and communication industry through state of art technical knowledge and innovative approaches beneficial to society.

1.3   Mission

- To promote teaching and learning by engaging in innovative research and by offering state-of- the-art undergraduate, postgraduate, and doctoral programs.
- To cultivate an entrepreneurial environment and industry interaction leading to the emergence of creators, innovators, and leaders.
- To promote co-curricular and extra-curricular activities for the overall personality development of the students.
- Building of responsible citizens through awareness and acceptance of ethical values

M. Tech. in Electronics and Communication Engineering (VLSI Design)

2.1   Preamble

M. Tech. ECE (VLSI) program offered at NIT Delhi is designed to equip the students with a unique blend of skill sets that include:

- Strong theoretical and experimental foundation
- Predominantly experiment oriented approach with access to well-equipped and specialized laboratories, and supervised internship/ Thesis work.
- Hands-on technical training
- Life skills orientation
- Hard and soft skills
- Business perspective, along with emphasis on innovation and entrepreneurship

2.2 Salient Features:

- Minimum Credits requirements for completion of M. Tech ECE (VLSI) program is 80.
- The Curriculum is based on the guidelines of National Education Policy (NEP) – 2020.
- The curriculum has embedded the Multi Exit/ Multi Entry in the M. Tech program.
- The curriculum is designed to meet the prevailing and ongoing industrial requirements.
- The curriculum includes Project based Education with adequate exposure for Thesis work.
- The curriculum is flexible and offers adequate Choice of Electives (Program Elective Courses).
- The curriculum inherits the Value based Education aims the Holistic Development of the students.
- The Curriculum offers Digital Pedagogy & Flipped Learning with adequate motivation for Entrepreneurship/ Start-ups.

2.3 Cardinal Mention

Students exiting after completing 1st Year will be awarded Post Graduate Diploma in ECE (VLSI) respectively. A minimum Credit requirement for Post Graduate Diploma is 40 Credits

2.4 Program Educational Objectives (PEOs)

| PEO-1	To be technically competent in the design, development, and implementation of VLSI circuits and systems to solve complex problems in the domain of electronics and communication.
PEO-2	Students shall be competent in adapting to new technologies for designing and implementation as well as lead research in order to achieve excellence in their professional career.
PEO-3	Enfold the capability to expand horizons beyond engineering for creativity, innovation and entrepreneurship.
PEO-4	Acquire competence and ethics for social and environmental sustainability with a focus on the welfare of humankind.

2.5 Program Outcomes (POs)

PO-1	Apply the knowledge of science, mathematics, and engineering principles for a problem-solving attitude and to acquire sound knowledge in the area of the VLSI domain.
PO-2	To design and analyze complex electronic circuits, using appropriate analytical methods as well as front-end and backend tools including prediction and modelling with an understanding of the limitations.
PO-3	An ability to independently carry out research /investigation and development work to solve practical problems and have the preparedness for lifelong learning.
PO-4	Ability to design and conduct experiments, as well as to analyse and interpret data, and synthesis of information.
PO-5	To comprehend and write effective reports and design documentation by adhering to appropriate standards and making effective presentations.
PO-6	Students will have a clear understanding of professional and ethical responsibility.

2.6 Program Specific Objectives (PSOs)

| PSO -1	Enable students to get deep knowledge in the domain of VLSI Design and be able to solve complex problems in the field of Electronics and Communication Engineering.
PSO -2	Enable students to carry out research work in emerging technologies and to pursue career in higher studies and research.

3.1 Credit Distribution
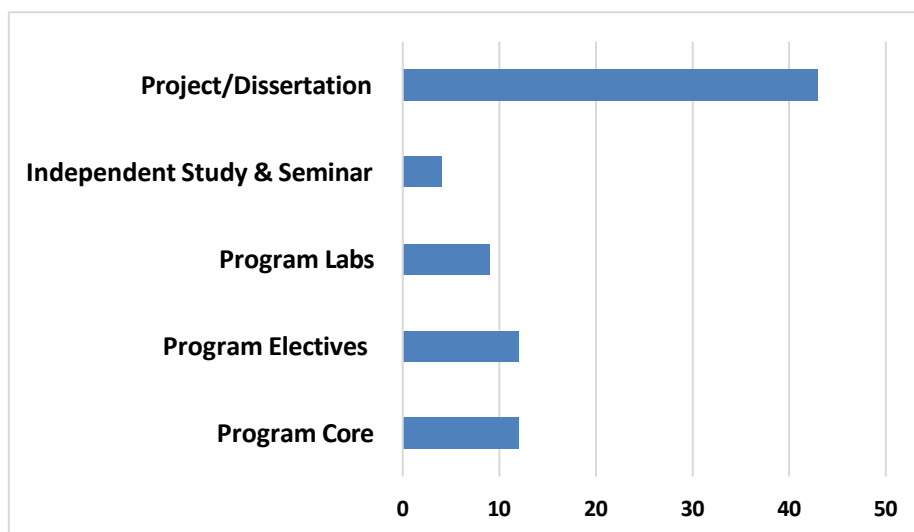
3.2 Semester wise Credit Structure

		Credits				
		1st Year		**2nd Year**		**Total**
S. No.	**Category of Courses**	**Semester I**	**Semester II**	**Semester III**	**Semester IV**	
1.	Program Core	9	3	-	-	**12**
2.	Program Electives	6	6	-	-	**12**
3.	Program Labs	3	6	-	-	**9**
4.	Independent Study & Seminar	2	2	-	-	**4**
5.	Project/Dissertation	-	3	20	20	**43**
Total		**20**	**20**	**20**	**20**	**80**

Minimum Credits Required for Award of Degree = 80

3.3   Credit Distribution (in %)
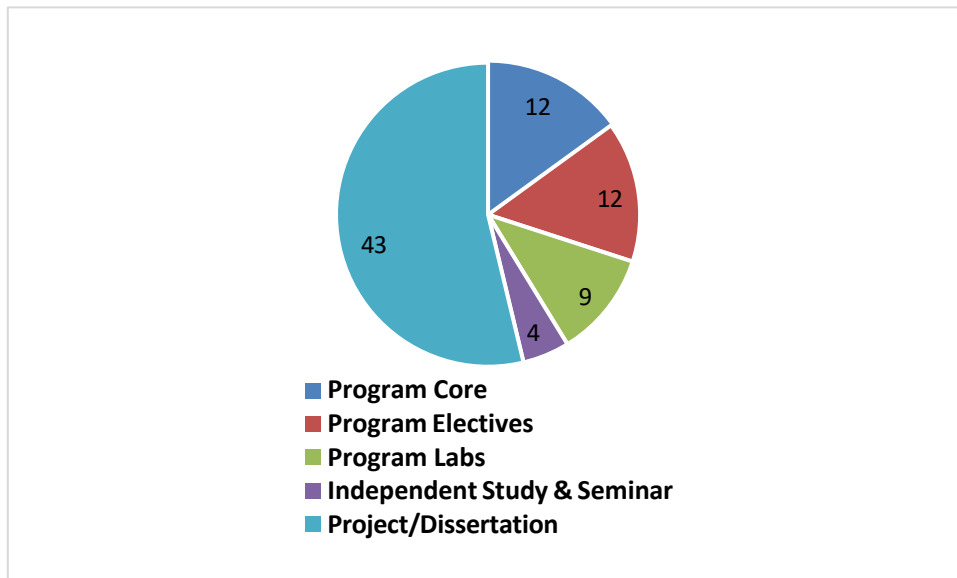
Course Coding Pattern		
Semester	M. Tech in ECE	M. Tech in ECE (VLSI Design)
Departmental Core Courses (Theory)		
Autumn Semester	ECEM (5/6)0x (onwards)	ECVM (5/6)0x (onwards)
Spring Semester	ECEM (5/6)5x (onwards)	ECVM (5/6)5x (onwards)
Departmental Elective Courses (Theory)		
Autumn Semester	ECEM (5/6)2x (onwards)	ECVM (5/6)2x (onwards)
Spring Semester	ECEM (5/6)7x (onwards)	ECVM (5/6)7x (onwards)

Numeric for 1st year = 5; Numeric for 2nd year = 6;

Teaching Scheme for
M. Tech in Electronics and Communication Engineering (VLSI Design)

Semester I

Course Code	Course Title	L	T	P	Credits
ECVM 5xx	Core - I	3	0	0	3
ECVM 5xx	Core - II	3	0	0	3
ECVM 5xx	Core -III	3	0	0	3
ECVM 5xx	Elective-I	3	0	0	3
ECVM 5xx	Elective-II	3	0	0	3
ECVM 5xx	Lab - I	0	0	6	3
ECVM 507	Independent Study and Seminar	0	0	4	2
Total Credits		**15**	**0**	**10**	**20**

Semester II

Course Code	Course Title	L	T	P	Credits
ECVM 5xx	Core IV	3	0	0	3
ECVM 5xx	Elective-III	3	0	0	3
ECVM 5xx	Elective-IV	3	0	0	3
ECVM 5xx	Lab - II	0	0	6	3
ECVM 5xx	Lab - III	0	0	6	3
ECVM 557	Independent Study and Seminar	0	0	4	2
ECVM 558	Minor Project	0	0	6	3
Total Credits		**9**	**0**	**22**	**20**

Semester III

Course Code	Course Title	L	T	P	Credits
ECVM 601	Dissertation I	0	0	32	16
ECVM 602	MOOCs Course – I/ Independent Study Course - I	3	0	0	3
ECVM 603	Seminar - I	0	0	2	1
Total Credits		**3**	**0**	**34**	**20**

Semester IV

Course Code	Course Title	L	T	P	Credits
ECVM 651	Dissertation II	0	0	32	16
ECVM 652	MOOCs Course – II/ Independent Study Course - II	3	0	0	3
ECVM 653	Seminar - II	0	0	2	1
Total Credits		**3**	**0**	**34**	**20**

Special Note for Selection of Massive Open Online Courses (MOOCs)/ Independent Study Courses

- Students are encouraged to take the above-mentioned MOOCs courses in their 3rd and 4th semesters preferably. The MOOCs courses can only be decided by the students in consultation with the Convener, DPGC (ECE) and HoD (ECE) and should be in allied/ relevant area of VLSI or related to the list of elective courses provided in the scheme.

- However, students willing to take those above MOOCs courses during their 1st and 2nd semester are also allowed but their evaluation and marks to be credited during their 3rd and 4th semesters respectively as indicated above.

- If a student completes a MOOC course and submits the evaluation result by the end of 3rd and 4th semester respectively, the they will be exempted from appearing for the Institute examination in the respective Independent Study Course – I (in the 3rd semester) and Independent Study Course – II (in the 4th semester).

- A student failing to complete the MOOC courses will have to choose an Independent Study course-I (in the 3rd semester) and Independent Study Course – II (in the 4th semester), (*from the list of elective courses and also which is not running in that semester/ previously not studied by the concern student*), have to complete (as per the Institute's procedure) the self-study and examinations as per the Institute's rules and regulations.

List of Core Subjects

S. No.	Course Code	Course Title	L	T	P	Credits	Core Applicability
1.	ECVM 501	Semiconductor Devices	3	0	0	3	Core I + Core II + Core III
2.	ECVM 502	Digital IC Design	3	0	0	3	
3.	ECVM 503	Analog IC Design	3	0	0	3	
4.	ECVM 551	System-on-Programmable Chip Design	3	0	0	3	Core IV

List of Laboratory Subjects

S. No.	Course Code	Course Title	L	T	P	Credits	Lab Applicability
1.	ECVM 505	Analog and Digital Design Laboratory	0	0	6	3	Lab I
2.	ECVM 554	High level Design Laboratory	0	0	6	3	Lab II + Lab III
3.	ECVM 555	System-on-Programmable Chip Design Lab	0	0	6	3	

List of Elective Subjects

S. No.	Course Code	Course Title	L	T	P	Credits	Elective Applicability
1.	ECVM 520	Real Time Signal Processing Systems	3	0	0	3	Elective I + Elective II
2.	ECVM 521	VLSI Systems Design	3	0	0	3	
3.	ECVM 522	Embedded Systems & RTOS	3	0	0	3	
4.	ECVM 523	Architectural Design of IC`s	3	0	0	3	
5.	ECVM 524	VLSI Testing	3	0	0	3	
6.	ECVM 525	RF IC Design	3	0	0	3	
7.	ECVM 526	VLSI Technology	3	0	0	3	
8.	ECVM 527	VLSI Signal Processing	3	0	0	3	
9.	ECVM 528	Block chain Design and Use Cases	3	0	0	3	
10.	ECVM 570	Low Power Design Techniques	3	0	0	3	Elective III + Elective IV
11.	ECVM 571	Mapping Signal Processing Algorithm on DSP Architectures	3	0	0	3	
12.	ECVM 572	MOS Devices Modelling and Characterization	3	0	0	3	
13.	ECVM 573	Mixed Signal IC Design	3	0	0	3	
14.	ECVM 574	High Speed System Design (Board level)	3	0	0	3	
15.	ECVM 575	Advanced Digital System Design	3	0	0	3	