Master of Technology in
VLSI
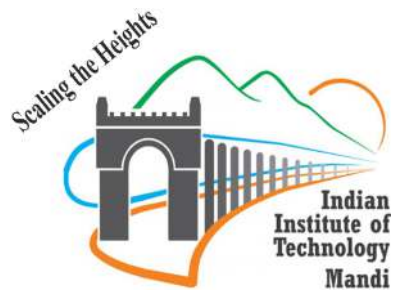
Programme Level	Post Graduate
Year of Commencement	2018
Minimum Duration	2 Years (4 Semesters)
Maximum Duration	3 Years (6 Semesters)
Senate Meeting Reference	16.5/18.5/35.14

Objectives of the Program

After undergoing this program, the student will acquire both theoretical knowledge and practical skills in Electrical Engineering with specialization of VLSI and chip designing. The curriculum in supported with the advance learning courses of VLSI specialization in device level understanding, design, fabrication and tools. During M. Tech thesis, the students will use VLSI design, testing and fabrication laboratories. For a better insight of the specialization, the core laboratories for VLSI design and fabrication have been designed with considering experimental understanding of the Specialization Core courses. The laboratory experiments will build the basic concepts and the advanced concepts for chip designing. The VLSI laboratories will be the part of VLSI centre of IIT Mandi. Moreover, these VLSI laboratories will be further useful for undergraduate students of IIT Mandi, in advance learning of B. Tech with VLSI as minor area. The UG students will also use the VLSI centre facility to execute their major technical project. It is envisaged that adjunct faculty from industry such as SCL (Mohali). STMicroelectronics, Texas instruments, Analog Devices, NXP, Synopsys, Cadence, Mentor Graphics etc. will be engaged to provide industrial experience to M. Tech students.

The proposed M. Tech course is with the vision of center for design and fabrication of electron devices (C4DFED) at IIT Mandi. This is also a part of the special man-power development project from system to chip design (SMDP-C2SD) under the Ministry of Electronics and Information Technology (MeitY). The MeitY will be funding for the designed chip as a part of the M. Tech thesis under the India Chip Program. This initiative to fulfill the goal of development of country in the vision and mission of make in India.

How is this program different

- Very strong industry oriented curriculum.
- Practicum based learning.
- Industry oriented courses.
- The Chip designing EDA tools (Cadence, Mentor Graphics, Synopsys, Silvaco, Centaurus and Comsol) based learning. These tools are the latest one and used in all the VLSI industries.
- 100 Class and 1000 Class clean room facility available at IIT Mandi for device fabrications.
- Sophisticated instrumentations facility available for device fabrications and characterizations.
- Learning design as well as fabrication aspects of the chip.
- Generate and trained manpower for semiconductor design and upcoming fab-line in India.
- There is a vast market opportunities for the graduating students.

Revision in the curriculum of M.Tech VLSI programme

To get a degree in M.Tech [VLSI] from IIT Mandi, a student has to complete 70 credits (minimum). The course structure has discipline core, mostly offered in the first semester of the program. The core practicum courses will be going in parallel to the theory courses. A student can choose any of the discipline electives as per his/her choice of interest. Some general details about the M.Tech in VLSI at IIT Mandi are as follows.

1. There are six discipline core courses with a total of 17 credits.
2. There are three discipline elective courses with a total of 9 credits (minimum).
3. Two electives from outside discipline with a total of 6 credits.
4. A student can choose the elective (discipline and outside electives) courses in any semester.
5. The post graduate project is of one year in duration. Evaluated in two parts (17 credits for each semester) with a total of 34 credits.
6. A technical communication course of 1 credit as institute core.
7. A research study course as a discipline core course, which will be offered in the winter break is of 3 credits.

Overall credit structure:

Category	Discipline Core	Discipline Elective	Free Elective	Institute Core	Project	Total
Credits	17+3*	9	6	1	34	70

*Research study (3 credit) course as a discipline core for M.Tech VLSI program, which will be offered in the winter break after first semester.

List of Core courses for M.Tech in VLSI

(Total credits for discipline core = 17)

S. No	Course Code	Name	L-T-P-C	Semester
1	EE 524	Digital MOS LSI Circuits	3-0-0-3	I
2	EE 519P	CMOS Digital IC Design Practicum	0-0-3-2	I
3	EE 520	Microelectronic Devices and Modelling	3-0-0-3	I
4	EE 512	CMOS Analog IC Design	3-0-2-4	I
5	EE 611	VLSI Technology	3-0-0-3	II
6	EE 611P	VLSI Fabrication Practicum	0-0-3-2	II

Semester wise Course Schedule for M.Tech (VLSI)

Total No. of Credits	70

FIRST SEMESTER (1st Sem)

Number	Title of the Course	L-T-P-C	Credits
EE 524	Digital MOS LSI Circuits	3-0-0-3	3
EE 519P	CMOS Digital IC Design Practicum	0-0-3-2	2
EE 520	Microelectronic Devices and Modelling	3-0-0-3	3
EE 512	CMOS Analog IC Design	3-0-2-4	4
	Open Elective Outside Discipline – I	3-0-0-3	3
HS 541	Technical Communication	1-0-0-1	1
EE xxx	Research Study*	0-0-6-3	3
	Total Credits		19

*The course will be part of winter vacation and grades to be submitted at the beginning of second semester.

SECOND SEMESTER (2nd Sem)

Number	Title of the Course	L-T-P-C	Credits
EE 611	VLSI Technology	3-0-0-3	3
EE 611P	VLSI Fabrication Practicum	0-0-3-2	2
	Open Elective Outside Discipline - II	3-0-0-3	3
	Discipline Elective - I	3-0-0-3	3
	Discipline Elective - II	3-0-0-3	3
	Discipline Elective - III	3-0-0-3	3
	Total Credits		17

THIRD SEMESTER (3rd Sem)

Number	Title of the Course	L-T-P-C	Credits
EE 650P	Post Graduate Project-1	0-0-34-17	17
	Total Credits		17

FOURTH SEMESTER (4th Sem)

Number	Title of the Course	L-T-P-C	Credits
EE 651P	Post Graduate Project-2	0-0-34-17	17
	Total Credits		17

List of Discipline Electives:

1. EE 516 - Biomedical systems (2.5-1.5-0-4)
2. EE 523 - Digital VLSI Architecture (3-0-2-4)
3. EE 526 - Power semiconductor devices (3-0-0-3)
4. EE 529 - Embedded System Design (3-0-2-4)
5. EE 560 - Reconfigurable Computing (3-0-2-4)
6. EE 592 - Selected topics on Formal Verification (3-0-0-3)
7. EE 593 - Selected topics on Low Power VLSI Design (3-0-0-3)

8. RFIC Design
9. CAD for VLSI Design
10. Mathematical optimization
11. EE 507 - Transmission lines and Basic Microwave engineering
12. EE 615 - Nano electronics and Microfabrication (3-0-0-3)
13. EE 619 - Mixed signal VLSI Design (3-0-2-4)
14. EE 621 - Microwave integrated circuits (3-0-0-3)
15. CS 541P - IOT systems and cloud (1-0-3-3)
16. CS 507 – Computer Architecture (4-0-0-4)
17. PH 502 - Photonics (3-0-0-3)
18. ME 509 - Nanomanufacturing (3-0-0-3)
19. PH 504 - Organic opto electronics (3-0-0-3)
20. PH 511 - Mathematical Physics (4-0-0-4)

Old Curriculum

Course Structure

1ˢᵗ Semester

Code	Course Title	Credit L-T-P-C
EE 524	Digital MOS LSI Circuits	3-0-0-3
EE 519P	CMOS Digital IC design Practicum	0-0-3-2
EE 520	Microelectronic devices and modeling	3-0-0-3
EE 512	CMOS Analog IC Design	3-0-2-4
	Open Elective Outside Discipline - I	3-0-0-3
HS 541	Technical Communication	1-0-0-1
EE XXX	Independent study*	0-0-6-3
	Total Credits	**19**

2ⁿᵈ Semester

Code	Course Title	Credit L-T-P-C
EE 611	VLSI technology	3-0-0-3
EE 611P	VLSI fabrication Practicum	0-0-3-2
	Open Elective Outside Discipline - II	3-0-0-3
EE 529	Embedded System Design	3-1-0-4
	Discipline Elective-I	3-0-0-3
	Discipline Elective – II	3-0-0-3
	Total Credits	**18**

3ʳᵈ Semester

Code	Course Title	Credit L-T-P-C
EE 650P	Post Graduate Project-1*	0-0-34-17
	Total Credits	**17**

4ᵗʰ Semester

Code	Course Title	Credit L-T-P-C
EE 651P	Post Graduate Project-2*	0-0-34-17
	Total Credits	**17**

* With the concern of student and his/her M Tech thesis supervisor, M.Tech. thesis can be carried out at industry.

Discipline Elective –I

EE 615 - Nano electronics and Microfabrication (3-0-0-3)
PH 502 - Photonics (3-0-0-3)
ME 509 - Nanomanufacturing (3-0-0-3)
EE 526 - Power semiconductor devices (3-0-0-3)
PH 504 - Organic opto electronics (3-0-0-3)

Discipline Elective –II

EE 619 - Mixed signal VLSI Design (3-0-2-4)
EE 621 - Microwave integrated circuits (3-0-0-3)
EE 523 - Digital VLSI Architecture (3-0-0-3)
CS 541P - IOT systems and cloud (1-0-3-3)
EE 516 - Biomedical systems (2.5-1.5-0-4)
CS 507 - Computer architecture (4-0-0-4)
EE 592 – selected topics on formal verification