

Master of Technology in Structural Engineering



Programme Level	Post Graduate
Year of Commencement	2018
Minimum Duration	2 Years (4 Semesters)
Maximum Duration	3 Years (6 Semesters)
Senate Reference	16.4/18.5/19.3/28.7

School of Engineering

1. Preamble to the program:

As our country is going through a rapid growth in infrastructure development sector, we need to develop quality engineers capable of handling specialized projects and be the leader in the industry. We also need to nurture motivated students for higher studies and contribute to the research and indigenous development of technologies. Keeping these ideas in mind, a postgraduate programme with specialization in Structural Engineering is proposed here in the School of Engineering. Moreover, it is expected to strengthen the goal of conducive development of the local region through this program. With development of the experimental and computational facilities and trained manpower, the institute can contribute more to the local and national need.

One of the visible descriptions of a developed nation is its state-of-the-art civil infrastructures, e.g. iconic buildings, bridges, towers etc., wherein structural engineers play a major role to develop them. As we are looking for more and more resilient societies against natural and accidental hazards, the need of specialized and trained structural engineers are inevitable for designing such infrastructures. Moreover, our country is aiming to develop hundreds of smart cities in coming years. These ambitious projects need enormous amount of buildings and other critical infrastructures to support the communities and industries. Therefore, the industry demand for specialized and trained structural engineers is expected to be huge. Furthermore, to support the goal of becoming a world leader in research activities, it is necessary to nurture the motivated and focused young graduates to take up research careers and tackle the challenging problems of our country's infrastructure development.

The program is aimed to focus on the analysis for and design against various natural hazards such as earthquake, especially in the Himalayan region. Students will learn the theory along with tools for analysis of such hazards and possible measures to mitigate the risk. Emphasis will be given on the probabilistic seismic hazard analysis, and specific techniques suitable for earthquake resistant and sustainable constructions in the earthquake prone hilly regions. Specific courses will focus on the stability of slopes and mitigation of landslides in the hilly terrain. Moreover, the students will be equipped with the theories and applications of various structural health monitoring techniques and suitable strengthening measures. Laboratory courses are designed to impart practical knowledge on using various tools for characterizing, modelling and analyzing structures before and after its construction to mitigate the risk.

2. Objectives of the program:

Upon completion of this M.Tech. program, the students are expected to grow significant analytical and practical knowledge in Structural Engineering to support the country's acute need of: (a) trained engineer to build the infrastructure, as well as (b) motivated scholars to carry forward the cutting-edge research. The core course content is developed in such a way that the students get sufficient exposure to various aspects of Structural Engineering. Whereas, the elective courses are planned for helping the students to foster their research interest in areas like structural dynamics, earthquake engineering, material science, structural health monitoring etc. Moreover, strong industry connections are envisioned in the areas of seismic hazard analysis, earthquake resistant design, structural health monitoring etc. through research projects and internships to be taken up by the students. Furthermore, being located in the lap of the great Himalaya, students will be exposed to various state-of-the-art techniques for design and construction of structures in difficult terrain and use of locally available resources. The objectives of this M.Tech. program are:

- (i) Making the students conceptually sound with strong analytical skills in the domain of Structural Engineering.
- (ii) Fulfilling the industry need of trained and capable structural engineer to take up challenging and innovative infrastructure projects.
- (iii) Motivating students for taking up career in research and academics to support the ambition of becoming a research powerhouse in the domain of structural engineering.

**1. Details of the courses and credit distribution (Revision approved in 28th Senate Meeting)
(Applicable on the M.Tech 2020 batch onwards)**

Semester – I (18 Credits)					
Sl. No.	Course Title	Credit Structure			
		L	T	P	C
1	CE557 - Solid Mechanics in Structural Engineering (DC)	3	0	0	3
2	CE555 - Advanced Design of Structures (DC)	3	0	0	3
3	CE511 - Structural Dynamics with Application to Earthquake Engineering (DC)	3	0	0	3
4	ME504 - Numerical Methods for Engineering Computation (MC)	3	0	0	3
5	Discipline Elective-I (DE)	3	0	0	3
6	CE556P - Structural Engineering Laboratory (DC)	0	0	4	2
7	HS541 - Technical Communication (TC)	1	0	0	1
Semester – II (22* Credits)					
Sl. No.	Course Title	Credit Structure			
		L	T	P	C
1	CE586P - Mini Project*	0	0	6	3
2	ME513 - Finite Element Methods in Engineering (DC)	3	0	2	4
3	Discipline Elective-II (DE)	3	0	0	3
4	Discipline Elective-III (DE)	3	0	0	3
5	Discipline Elective-IV (DE)	3	0	0	3
6	Outside Discipline Elective-I (ODE)	3	0	0	3
7	Outside Discipline Elective -II (ODE)	3	0	0	3
Semester – III (15[§] Credits)					
Sl. No.	Course Title	Credit Structure			
		L	T	P	C
1	CE587P - Industrial/Academic Internship [§]	0	0	2	1
3	CE688P - Post Graduate Project – 1	0	0	28	14
Semester – IV (15 Credits)					
Sl. No.	Course Title	Credit Structure			
		L	T	P	C
1	CE689P - Post Graduate Project – 2	0	0	30	15

DC – Discipline Core.

MC – Mathematics Core.

*3 credits (CE586P) is to be completed during the winter break, course registration and grade submission are to be done along with the second semester.

[§]1 credit is to be completed during the summer break, course registration and grade submission are to be done along with the third semester.

2. Categorical distribution of the minimum credits

Sl. No.	Course Category	Credits
1	Discipline Core (DC)	15
2	Mathematics Core (MC)	03
3	Discipline Electives (DE)	12
4	Outside Discipline Electives (ODE)	06
5	Technical Communication (TC)	01
6	Mini Project and Design Practicum/Internship	04
7	Postgraduate Project (PGP)	29
	Total Credits	70~72*

*Up-to 72 credits will be considered in the calculation of Cumulative Grade Point Average (CGPA).

3. Discipline Core (DC) Courses

- (i) Solid Mechanics in Structural Engineering (CE557)
- (ii) Advanced Design of Structures (CE555)
- (iii) Structural Dynamics with Application to Earthquake Engineering (CE511)
- (iv) Finite Element Methods in Engineering (ME513)
- (v) Structural Engineering Laboratory (CE556P)

4. Mathematics Core (MC) course

- (i) Numerical Methods for Engineering Computation (ME504)
- (ii) Any suitable courses with prior permission

5. Discipline Elective (DE) courses

- (i) Analysis and Design for Earthquake Resistant Structures (CE610)
- (ii) Bridge Engineering (CE509)
- (iii) Engineering Seismology and Seismic Hazard Assessment (CE605)
- (iv) Structural Health Monitoring (CE611)
- (v) Advanced Concrete Science (CE507)
- (vi) Concrete Technology (CE552)
- (vii) Mechanics of Composite Materials (ME617)
- (viii) Prestressed Concrete Structures (CE554)
- (ix) Slope Stability and Retaining Structures (CE504)
- (x) Theory of Plates and Shells (CE612)
- (xi) Soil Dynamics (CE560)
- (xii) Any other courses with prior permission

**Details of the courses and credit distribution
(Applicable on the M.Tech 2019 and earlier batches)**

1st Semester

Code	Course Title	Credit L-T-P-C
CE 557	Solid Mechanics in Structural Engineering (SC)	3-0-0-3
CE 555	Advanced Design of Structures (SC)	3-0-0-3
CE 511	Structural Dynamics with Application to Earthquake Engineering (SC)	3-0-0-3
ME 504	Numerical Methods for Engineering Computation (MC)	3-0-0-3
	Specialization Elective-I (SE)	3-0-0-3
CE 556P	Structural Engineering Laboratory (SC)	0-0-4-2
HS 541	Technical Communication (TC)	1-0-0-1
	Total Credits	18

Winter Term

Code	Course Title	Credit L-T-P-C
CE 586	Mini Project*	0-0-6-3
	Total Credits	3

2nd Semester

Code	Course Title	Credit L-T-P-C
ME 513	Finite Element Methods in Engineering (SC)	3-0-2-4
	Specialization Elective-II (SE)	3-0-0-3
	Specialization Elective-III (SE)	3-0-0-3
	Specialization Elective-IV (SE)	3-0-0-3
	Outside Discipline Elective-I (ODE)	3-0-0-3
	Total Credits	16

Summer Term

Code	Course Title	Credit L-T-P-C
CE587	Industrial/Research Internship ⁵	0-0-2-1
	Total Credit	1

3rd Semester

Code	Course Title	Credit L-T-P-C
	Outside Discipline Elective –II (ODE)	3-0-0-3
CE688P	Post Graduate Project – I	0-0-24-12
	Total Credits	15

4th Semester

Code	Course Title	Credit L-T-P-C
CE689P	Post Graduate Project – II	0-0-34-17
	Total Credits	17

SC - Specialization Core; MC – Mathematical Core.

*To be graded.

Winter Term - I will begin at the end of first semester and end at the beginning of the second semester.

⁵To be evaluated as Satisfactory/Un-satisfactory.

Summer Term – I will begin at the end of second semester and end at the beginning of the third semester.

3. Some of the specialization elective (SE) courses:

- (i) Advanced Concrete Science (CE507)
- (ii) Analysis and Design for Earthquake Resistant Structures (CE610)
- (iii) Bridge Engineering (CE509)
- (iv) Concrete Technology (CE552)
- (v) Engineering Seismology and Seismic Hazard Assessment (CE605)
- (vi) Mechanics of Composite Materials (ME617)
- (vii) Prestressed Concrete Structures (CE554)
- (viii) Slope Stability and Retaining Structures (CE504)
- (ix) Structural Health Monitoring (CE611)

- (x) Theory of Plates and Shells (CE612)