Proposed Curriculum
for **B. Tech in**
Civil Engineering
(With Specialization in Structural/Geotechnical/ Transportation/Environmental /Water Resources Engineering)
2022-2023 onwards

In the CE Department

NATIONAL INSTITUTE OF TECHNOLOGY DELHI

(An autonomous Institute under the aegis of

Ministry of Education, Govt. of India)

Department of Civil Engineering
National Institute of Technology Delhi

1.1 About the Department

Welcome at the Department of Civil Engineering (CE), National Institute of Technology Delhi. It established in 2022, under the ages of Ministry of Education (MoE), Govt. of India. Currently it is offering one Undergraduate (B. Tech) course. It has excellent laboratories and research facilities. The Department has active collaborations with Institutes & research institutes. The department welcomes all types of consultancy works.

The Department of CE 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 diversified field and having adequate experience in advanced research. The Department believes that by developing a culture of seeking for knowledge and dissemination of research findings, intellectually sound, self-motivated and reliant CE engineers and researchers, who will be the bedrock of our nations' match towards qualitative and massive technological development and dynamic industrialization, will be realized. In other words, the department hopes to achieve the national goals and objectives of industrialization and self-reliance. As a result, it hopes to produce graduates with strong academic and practical background so that they can fit into the industry immediately upon graduation.

1.2 Vision

- Create an Educational environment to prepare the students to meet the challenges of current Industry through state of art technical knowledge and innovative approaches.

1.3 Mission

- To create learning, Development and testing environment to meet ever challenging needs of the Industry.
- To create entrepreneurial environment and industry interaction for mutual benefit.
- To be a global partner in training human resources in the field of structural, geotechnical, transportation, environmental, water resources engineering.
- To associate with international reputed institution for academic excellence and collaborative research.

B. Tech. (Civil Engineering)

2.1 Preamble

B. Tech. (Civil Engineering) program offered at NIT Delhi is designed to equip students with a unique blend of skill sets that include:

- Strong theoretical foundation
- Predominantly practice-oriented approach with access to well-equipped and specialized laboratories, and supervised internship via the Practice School
- 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 BTech program is 160.
- The Curriculum is based on the guidelines of National Education Policy (NEP) – 2020.
- The curriculum has embedded the Multi Exit/ Multi Entry in the BTech program.
- There is provision of Major degree and Minor Degree for students.
- The curriculum is designed to meet the prevailing and ongoing industrial requirements.
- The curriculum includes Project based Education with Projects every year.
- The curriculum is flexible and offers Choice Based Credit System (CBCS).
- The curriculum inherits the Value based Education and offers Interdisciplinary/ Multidisciplinary Courses.
- The Curriculum offers Digital Pedagogy & Flipped Learning with adequate motivation for Entrepreneurship/ Startups.
- The curriculum aims the Holistic Development of the students.

2.3 Cardinal Mentions

- Students exiting after completing 1st Year, 2nd Year and 3rd Year will be awarded Certificate, Diploma and Advanced Diploma in Civil Engineering respectively. A minimum Credit requirement for Certificate is 40 Credits, Diploma is 80 Credits and Advanced Diploma is 120 Credits respectively.

- The students can opt for Minor Degree across any specialization offered in the Institute from 5th Semester e.g. a student pursuing B. Tech. (Civil Engineering) may opt for Minor Degrees offered by the different Departments in the Institute depending upon his/her interest.

- The students opting for Minor Degree will have to earn additional credits for the Minor Degree as per Institute norms which may vary from time to time.
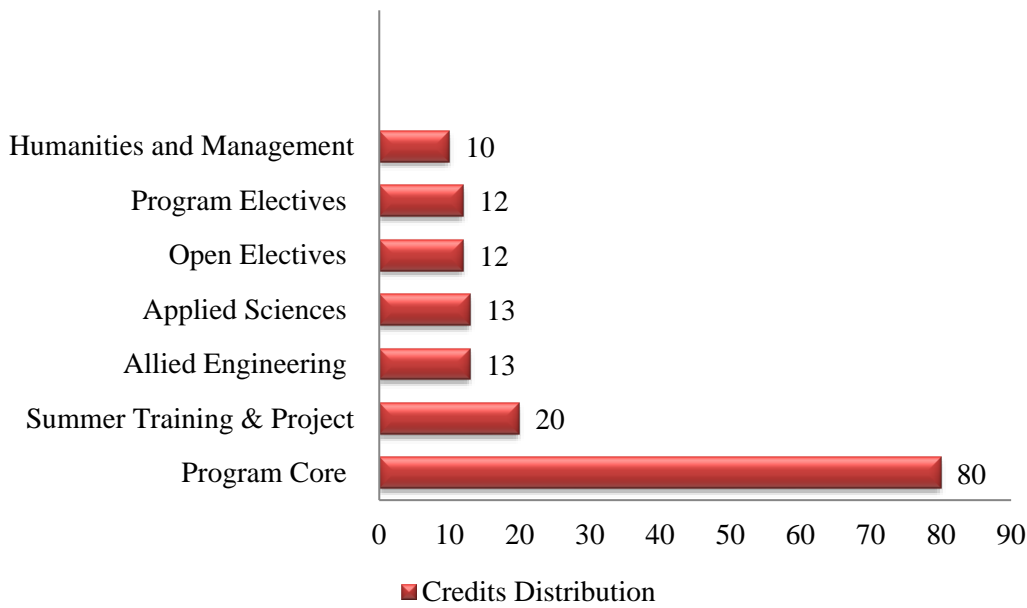
2.4   Program Educational Objectives (PEOs)

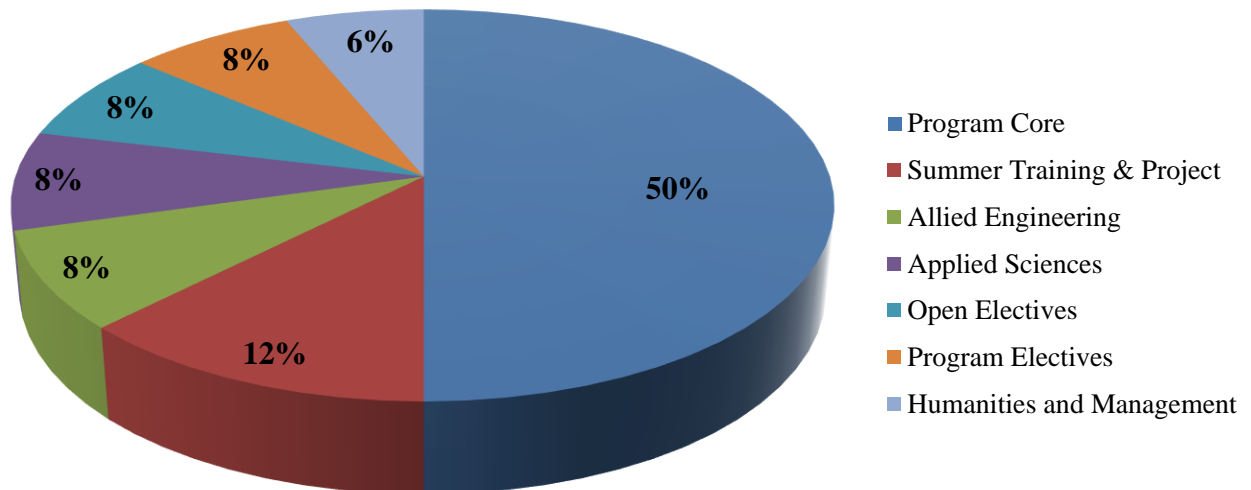| PEO-1	Engineering Graduates will excel in Civil Engineering fields both in the industry and in academics by analyzing the requirement technically and applying their knowledge in a professional manner.
PEO-2	Demonstrate multi-disciplinary knowledge and skills to analyze, interpret and create solutions to the real-life Civil engineering problems.
PEO-3	Embrace capability to expand horizons beyond engineering for creativity, innovation and entrepreneurship.
PEO-4	Imbibe competence and ethics for social and environmental sustainability with a focus on the welfare of humankind.

2.5   Program Outcomes (POs)

PO-1	**Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO-2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO-3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO-4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO-5	**Modern Tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO-6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO-7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO-8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO-9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO-10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO-11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO-12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

2.6   Program Specific Objectives (PSOs)

PSO -1	Students will be able to analyze, interpret and provide solutions to real life Civil engineering problems.
PSO -2	Graduates of the program will be able to design and develop systems/processes based on core concepts of Civil engineering to provide solution to multidisciplinary engineering problems.
PSO -3	Students will be able to pursue higher studies for contribution to research and development as well as participate in Entrepreneurs.

3.1 Semester wise Credit Structure

		Credits								
Sl. No.	**Courses**	**1st Year**		**2nd Year**		**3rd Year**		**4th Year**		**Total**
		1st Sem	**2nd Sem**	**3rd Sem**	**4th Sem**	**5th Sem**	**6th Sem**	**7th Sem**	**8th Sem**	
1	Program Core	9	7	16	20	16	12			80
2	Program Electives							9	3	12
3	Open Electives						3	6	3	12
4	Applied Sciences	3	7			3				13
5	Humanities and Management	1	3				3	3		10
6	Summer Training & Project		1			1	2	2	14	20
7	Allied Engineering	7	2	4						13
Total		**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**160**

3.2 Credits Distribution

Credits Distribution bar chart:

- Humanities and Management: 10
- Program Electives: 12
- Open Electives: 12
- Applied Sciences: 13
- Allied Engineering: 13
- Summer Training & Project: 20
- Program Core: 80

3.3 Credits Distribution (%)

Credits Distribution (%)

- Program Core: 50%
- Summer Training & Project: 12%
- Allied Engineering: 8%
- Applied Sciences: 8%
- Open Electives: 8%
- Program Electives: 8%
- Humanities and Management: 6%

4.1 Course Scheme

SEMESTER – I

Sl. No.		Course Name	Credits		L	T	P	C
1	CEL102	Fundamentals of Engineering Mechanics	3	3	3	0	0	3
2	CEL151	Elements of Civil Engineering	2	2	2	0	0	2
3	HMP102	Communication Skills	1	1	0	0	2	1
4	CYB100	Engineering Chemistry	2+1	3	2	0	2	3
5	MEB119	Engineering Graphics & AUTOCAD	2+1	3	2	0	2	3
6	ECB101	Basics of Electronics & Electrical Engineering	3+1	4	3	0	2	4
7	CEL103	Environmental Studies	3	3	3	0	0	3
8	CEP121	Nature and Care	1	1	0	0	2	1
			17+3	20	15	0	10	20

SEMESTER – II

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	MAL159	Mathematics for Engineers-I	3	3	3	0	0	3
2	CEL101	Civil Engineering Materials and Construction Techniques	3	3	3	0	0	3
3	HMB101	Theory and Practices of Human Ethics	2+1	3	2	0	2	3
4	CEB212	Mechanics of Solids	3+1	4	3	0	2	4
5	PHB111	Engineering Physics	3+1	4	3	0	2	4
6	MEB163	Engineering Workshop Practice	1+1	2	1	0	2	2
7	CEP171	Site visit report	1	1	0	0	0	1
		Total	**16+4**	**20**	**15**	**0**	**8**	**20**

SEMESTER – III

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	CEB211	Fluid Mechanics	2+1	3	2	0	2	3
2	CEL201	Analysis of Determinate Structures	3	3	3	0	0	3
3	CSB111	Computer Programming	3+1	4	3	0	2	4
4	CEB213	Concrete Technology	2+1	3	2	0	2	3
5	CEB214	Soil Mechanics	3+1	4	3	0	2	4
7	CEB265	Building Planning, Drawing and Construction	2+1	3	2	0	2	3
	Total		**15+5**	**20**	**15**	**0**	**10**	**20**

SEMESTER – IV

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	CEB261	Highways Engineering	3+1	4	3	0	2	4
2	CEB262	Design of Concrete Structures	3+1	4	3	0	2	4
3	CEB263	Water Supply Engineering and Pollution Control	3+1	4	3	0	2	4
4	CEB264	Hydrology and Irrigation Engineering	3+1	4	3	0	2	4
5	CEL251	Estimation, Costing and Valuation	1	1	0	0	2	1
6	CEB215	Surveying-I	2+1	3	3	0	2	3
	Total		**15+5**	**20**	**15**	**0**	**12**	**20**

NOTE: Summer Training (6-8 Weeks) is mandatory for each student to continue the program and the evaluation will take place in the Semester-V.

SEMESTER – V

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	CEL301	Analysis of Indeterminate Structures	4	4	3	1	0	4
2	CEL302	Liquid and Solid Waste Engineering	3	3	3	0	0	3
3	CEL303	Open Channel Flow	3	3	3	0	0	3
4	CEL304	Railways and Airport Engineering	3	3	3	0	0	3
5	CEB311	Surveying-II	3	3	3	0	0	3
6	MAL359	Mathematics for Engineers-II	3	3	3	0	0	3
7	CEP321	Summer Training- I	1	1	0	0	0	1
	Total		**20**	**20**	**18**	**1**	**0**	**20**

SEMESTER – VI

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	CEL351	Design of Steel Structures	3	3	3	0	0	3
2	CEL352	Design of Advanced Concrete Structures	3	3	3	0	0	3
3	CEL353	Foundation Engineering	3	3	3	0	0	3
4	CEL354	Construction Technology and Project Management	3	3	3	0	0	3
5	XXXXXX	Open Elective-I	3	3	3	0	0	3
6	HML359	Economics for Engineers	3	3	3	0	0	3
7	CEP371	Minor Project	2	2	0	0	0	2
	Total		**20**	**20**	**18**	**0**	**0**	**20**

NOTE: Summer Training (6 - 8 Weeks) is mandatory for each student to continue the program and the evaluation will take place in the Semester-VII.

SEMESTER –VII

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	CEL43X	Program Elective-I	3	3	3	0	0	3
3	CEL43X	Program Elective-II	3	3	3	0	0	3
4	CEL43X	Program Elective-III	3	3	3	0	0	3
5	HML402	Fundamentals of Business Analysis	3	3	3	0	0	3
6	XXXXXX	Open Elective-II	3	3	3	0	0	3
7	XXXXXX	Open Elective-III	3	3	3	0	0	3
8	CEP421	Summer Training – II	2	2	0	0	0	2
	Total		**20**	**20**	**18**	**0**	**0**	**20**

SEMESTER – VIII

Sl. No.	Course Code	Course Name	Credits		L	T	P	C
1	CEL48X	MOOCs (Program Elective-IV)	3	3	3	0	0	3
2	XXXXXX	MOOCs (Open Elective-IV)	3	3	3	0	0	3
3	CEP471	Major Project	14	14	0	0	0	14
	Total		**6+14**	**20**	**6**	**0**	**0**	**20**

NOTE: Any MOOC(s) offered and opted by the student need to be approved by UG Coordinator of Civil Department. There will be faculty advisor for CEP471 (Major Project).

4.2   Program Elective Courses

The following list of Program Electives I, II, III for each Specialization offered by the Department is tentative depending upon the requirements of the Industry/ Availability of faculties.

For students who want to take simple B.Tech in Civil Engineering may choose any course available from any specialization buckets.

Specialization: Structural Engineering

Sl. No.	Course Title	L	T	P	Credits
1	Advanced Structural Analysis	3	0	0	3
2	Theory of Elasticity and Plasticity	3	0	0	3
3	Structural Dynamics	3	0	0	3
4	Finite Element Analysis	3	0	0	3
5	Theory of Plates and Shells	3	0	0	3
6	Prestressed Concrete Structures	3	0	0	3
7	Earthquake Resistant Design of Structures	3	0	0	3
8	Optimization Techniques in Structural Engineering	3	0	0	3
9	Design of Masonry Structures	3	0	0	3
10	Advanced Concrete Technology	3	0	0	3
11	Artificial Intelligence in Structural Engineering	3	0	0	3
12	Analysis and Design of Bridges	3	0	0	3
13	Machine Learning Methods in Civil Engineering	3	0	0	3
14	Reliability Engineering	3	0	0	3
15	Structural Health Monitoring	3	0	0	3
16	Computer modeling of structures	3	0	0	3
17	Analysis and Design of High-Rise Buildings	3	0	0	3
18	Design of Bridge Substructures	3	0	0	3
19	Building Information Modelling	3	0	0	3

Specialization: Geotechnical Engineering

Sl. No.	Course Title	L	T	P	Credits
1	Earth Pressure and Retaining Structures	3	0	0	3
2	Advanced Foundation Engineering	3	0	0	3
3	Computer modeling in geotechnical engineering	3	0	0	3
4	Geotechnical Earthquake Engineering	3	0	0	3
5	Ground Improvement Techniques	3	0	0	3
6	Critical State Soil Mechanics	3	0	0	3
7	Geotechnical Investigations	3	0	0	3
8	Advanced Slope Analysis	3	0	0	3
9	Reliability and Risk Analysis in Geotechnical Engineering	3	0	0	3
10	Engineering Behavior of Soil	3	0	0	3
11	Advanced Mechanics of Solids	3	0	0	3
12	Geo-environmental Engineering	3	0	0	3
13	Geomechanics - Theory and Applications	3	0	0	3
14	Applied Rock Mechanics	3	0	0	3
15	Soil Structure Interaction	3	0	0	3
16	Reinforced Earth and Geotextiles	3	0	0	3
17	Earth and Rockfill Dams	3	0	0	3
18	FEM in Engineering Practice	3	0	0	3
19	Artificial Intelligence in Geotechnical Engineering	3	0	0	3
20	Transportation Geo techniques	3	0	0	3
21	Physicochemical Properties and Stabilization of Soils	3	0	0	3
22	Underground Structures	3	0	0	3
23	Optimization Techniques in Geotechnical Engineering	3	0	0	3

Specialization: Environmental Engineering

Sl. No.	Course Title	L	T	P	Credits
1	Air and Noise Pollution	3	0	0	3
2	Physicochemical Processes for Water and Wastewater Treatment	3	0	0	3
3	Biological Processes for Water and Wastewater Treatment	3	0	0	3
4	Planning and Design of Environmental Engineering Systems	3	0	0	3
5	Solid Waste Engineering and Management	3	0	0	3
6	Environmental Chemistry and Microbiology	3	0	0	3
7	Environmental Fluid Mechanics	3	0	0	3
8	Ecology	3	0	0	3
9	Environmental Sanitation	3	0	0	3
10	Environmental Laws, Regulation and Policy	3	0	0	3
11	Environmental Impact Assessment and Mitigation	3	0	0	3
12	Air Quality Modelling	3	0	0	3
13	Hazardous and Nuclear Waste Management	3	0	0	3
14	Industrial Waste Management and Audit	3	0	0	3
15	Life Cycle Analysis and Design for Environment	3	0	0	3
16	Geographical Information System	3	0	0	3
17	Environmental Management	3	0	0	3
18	Chemo Dynamics	3	0	0	3
19	Environmental Risk Assessment	3	0	0	3
20	Groundwater Pollution	3	0	0	3
21	Optimization Techniques	3	0	0	3
22	Artificial Intelligence in Engineering	3	0	0	3
23	Practical Reliability Engineering	3	0	0	3

Specialization: Water Resources Engineering

Sl. No.	Course Title	L	T	P	Credits
1	Irrigation Water Management	3	0	0	3
2	Advanced Hydrology	3	0	0	3
3	Advanced Hydraulics	3	0	0	3
4	Advanced Groundwater Engineering	3	0	0	3
5	River Morphology and Hydraulics	3	0	0	3
6	Remote Sensing and GIS for Water Resources	3	0	0	3
7	Disaster Management	3	0	0	3
8	Water Harvesting and Ground Water Recharge	3	0	0	3
9	River Pollution and Control	3	0	0	3
10	Statistical Methods in Hydrology	3	0	0	3
11	Computational Fluid Dynamics	3	0	0	3
12	Water Resources System's Analysis, Planning and Management	3	0	0	3
13	Advanced Land Drainage	3	0	0	3
14	Flood and Drought Management	3	0	0	3
15	Modeling of Water Resource Systems	3	0	0	3
16	Hydro Power Engineering	3	0	0	3
17	Unsteady Flows	3	0	0	3
18	Vadose Zone Hydrology	3	0	0	3
19	Advanced Hydraulic Structures	3	0	0	3
20	Optimization Theory and Practice	3	0	0	3
21	Artificial Intelligence in Water Resources Engineering	3	0	0	3
22	Reliability Engineering in practice	3	0	0	3

Specialization: Transportation Engineering

Sl. No.	Course Title	L	T	P	Credits
1	Airport Planning and Design	3	0	0	3
2	Transportation Planning	3	0	0	3
3	Pavement Materials	3	0	0	3
4	Traffic Engineering & Management	3	0	0	3
5	Pavement Analysis and Design	3	0	0	3
6	Remote Sensing & GIS and their Applicati	3	0	0	3
7	Intelligent Transportation Systems	3	0	0	3
8	Advanced Highway Design	3	0	0	3
9	Highway Subgrade and Foundation	3	0	0	3
10	Rural Roads Planning and Design	3	0	0	3
11	Highway Economics	3	0	0	3
12	Applied Probability and Statistics	3	0	0	3
13	Urban Transportation Planning	3	0	0	3
14	Traffic Flow Theory	3	0	0	3
15	Railway Engineering	3	0	0	3
16	Highway Construction Practices & Maintenance	3	0	0	3
17	Multi-modal Transportation System Planning and Design	3	0	0	3
18	Pavement Management System	3	0	0	3
19	Bridge Engineering	3	0	0	3
20	Highway Project Management	3	0	0	3
21	Hill Road Engineering	3	0	0	3
22	Pavement Mechanics	3	0	0	3
23	Harbour, Dock and Tunnel Engineering	3	0	0	3
24	Road Safety Analysis and Management	3	0	0	3
25	Optimization Methods	3	0	0	3
26	Artificial Intelligence	3	0	0	3
27	Introduction to Reliability Engineering	3	0	0	3

4.3   MOOCs

Student will take MOOCs (Program Elective-IV) and MOOCs (Open Elective-IV) based on availability of courses at SWAYAM portal during that year after discussion with UG Civil Coordinator.

**The Open Electives can be selected by the student from the Electives offered by other Departments for their respective B.Tech programs.