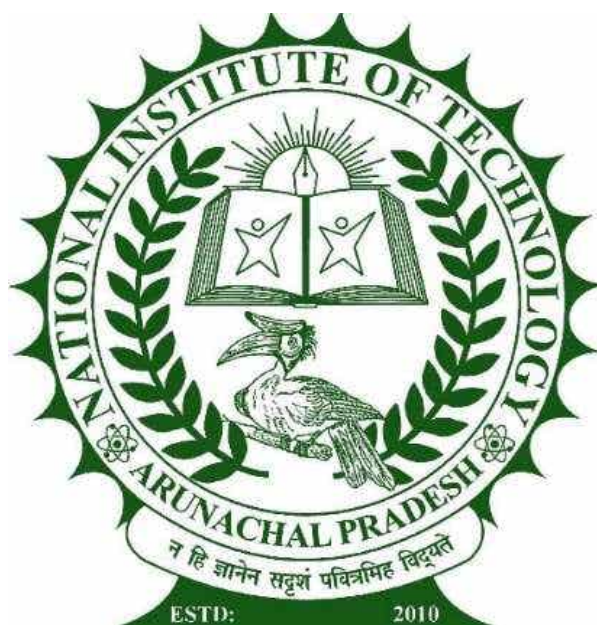


Course Curriculum (in light of NEP 2020) for B. Tech.

In
Civil Engineering
(For students admitted in 2025-26 onwards)



National Institute of Technology
Arunachal Pradesh
P.O.: Jote, Dist.: Papumpare, Arunachal Pradesh,
Pin–791113
www.nitap.ac.in

Semesters	1	2	3	4	5	6	7	8	
Minimum Credits	20	42	64	85	105	126	148	160-172	
Multiple Entry	ENTRY		ENTRY		ENTRY		ENTRY		
Studebt Support Programs	Intensive Orientation	Finishing School	Bridge Course	Finishing School	Bridge Course	Finishing School	Bridge Course	Finishing School	Finishing School
Degree/ Certification		Certificate		Diploma		B.Sc. Degree		B. Tech	B. Tech Honors
Multiple Exit Points		EXIT		EXIT		EXIT		EXIT	EXIT

Table 2. Course Structure and Credit Requirements

Description	Details	Total Credits	Comments	Exit Degree			
Mathematics + Science + Humanities + Arts	SMASH	26	Science+ Mathematics + Arts + Social Science + Humanities (SMASH) Basket	Eligible for Diploma in _____	Eligible for B. S. in Engineering Degree with Major in _____	Eligible for B. Tech. Degree (4-Year) with Major in _____	Eligible for B. Tech. With Honours Degree (4 Years) with Major in _____
Major	MA1	50	Major for 2-year Diploma				
Project and Internship	AP1	6	If opting for 2-year course				
Electives	E1	3	If opting for 2-year course				
Total (D)	SMASH + MA1 + AP1 + E1	85	Mandatory Credits for 2 Year Course				
Humanities	SMASH	3	Science+ Mathematics + Arts + Social Science + Humanities (SMASH) Basket				
Major	MA2	MA1+14 = 64	Major Basket - 1				
Project and Internship	AP2	AP1+5 =10					
Electives	E2	E1+19= 22	Electives				
Total (B1)	SMASH + MA2 + AP2 + E2	126	Mandatory Credits for 3 Year Course				
/ Elective	MA3	27	Electives				
Project & Internship	AP3	7					
Total (B2)	SMASH + MA2+MA3 + AP2 + AP3+E2	160	Mandatory Credits for 4 Year Course				
Honours*	Theory	12	Additional Subjects				
Total (B3)	Total	172					

Curriculum

1.0 Semester wise Credit point distribution

Sl. No.	Year	Credit Point	
		ODD	EVEN
1	First	20	22
2	Second	22	21
3	Third	20	21
4	Fourth	22	12
Total Credit Point		84	76
		160	

2.0 Subject Category wise Credit point Distribution

Course Category	Sem-I	Sem-II	Sem-III	Sem-IV	Sem-V	Sem-VI	Sem-VII	Sem-VIII	Total Credit Point
Science Core (SC)	6	2	3	0	0	0	0	0	11
Engineering Science and Arts (ESA)	6	13	2	0	0	0	0	0	21
Departmental Specific Core (DSC)	4	3	13	12	9	0	0	0	41
Departmental Specific Elective (DSE)	0	0	0	3	0	12	18	9	42
Open Elective (OE)	0	0	0	0	3	3	0	0	6
Ability Enhancement Compulsory Course (AECC)	0	0	0	0	1	0	1	0	2
Skill Enhancement Compulsory Course (SECC)	3	0	0	1	4	1	0	0	9
Value Added Course (VAC)	0	3	1	2	0	2	3	3	14
Laboratory (LAB)	1	1	3	3	3	3	0	0	14
Total Credit Point	20	22	22	21	20	21	22	12	160

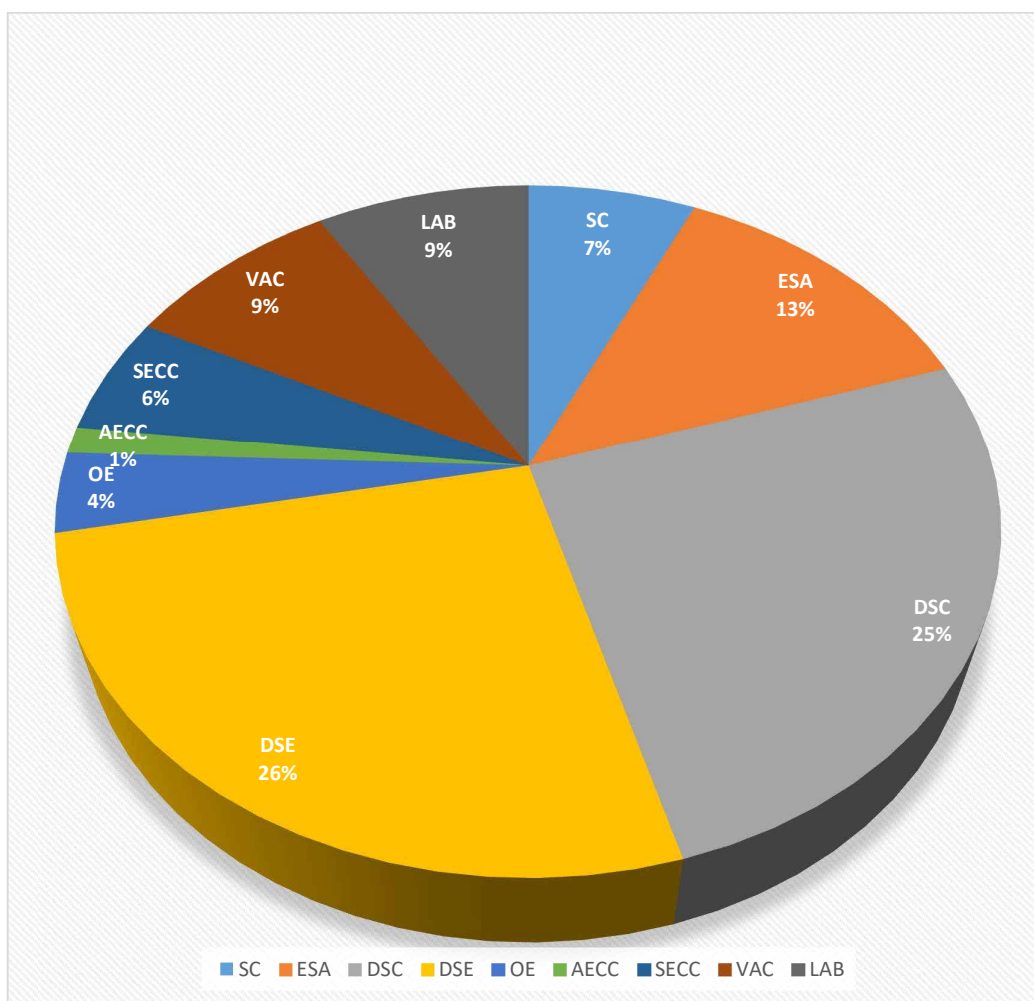


Fig.1- Subject Category wise Credit point Distribution (in percentage)

Year Wise Break-up for credit points under different category								
Year	SMASH	Project	Major	Electives	Open Electives	Total	Cumulative Credit	Exit Degrees
1st	21	2	19	0	0	42	42	Certificate
2nd	5	4	31	3	0	43	85	Diploma
3rd	3	5	14	16/22	3	41/47	126/132	BSc (Engg.)
4th	0	7	0	27/33	0	34/40	160/172*	B. Tech
Total	29	18	64	46/58	3	160/172*		-
With 172 Credit Student will get B. Tech with Hons.								

Semester Wise Break-up for credit requirements							
1st Semester Structure		2nd Semester Structure		3rd Semester Structure		4th Semester Structure	
Course Category	Credits	Course Category	Credits	Course Category	Credits	Course Category	Credits
SMASH	13	SMASH	8	SMASH	5	SMASH	0
MAJOR	7	MAJOR	12	MAJOR	16	MAJOR	15
AP01	0	AP01	2	AP01	1	AP01	3
						ELECTIVE	3
Total	20	Total	22	Total	22	Total	21

Semester Wise Break-up for credit requirements							
5 th Semester Structure		6 th Semester Structure		7 th Semester Structure		8 th Semester Structure	
Course Category	Credits	Course Category	Credits	Course Category	Credits	Course Category	Credits
SMASH	3	SMASH	0	SMASH	0	SMASH	0
MAJOR	12	MAJOR	2	MAJOR	0	MAJOR	0
AP02	2	AP02	3	AP03	4	AP03	3
OPEN ELECTIVE	3	ELECTIVE	16	ELECTIVE	18	ELECTIVE	9
Total	20	Total	21	Total	22	Total	12

3.0 Course Structure

Semester - I						
Sl No	Course Code	Course Title	L	T	P	C
1	BS-1101	SM-01-SC1 - Engineering Mathematics-I	2	0	0	2
2	BS-1102	SM-02-SC2 - Engineering Chemistry	2	0	0	2
3	BS-1103	SM-03-SC3 - Engineering Physics	2	0	0	2
5	CE-1101	MAJOR-01 - DSC1 - Building Planning, Construction Technology and Material	3	0	0	3
6	MH-1101	SM-04 - SECC1- Communication Skill	2	0	0	2
7	EE-1102	SM-05 - ESA2- Basic of Electrical and Electronics Engineering	2	0	0	2
8	CS-1102	MAJOR-02 - ESA3- Coding Laboratory	0	1	2	2
9	EE-1103	SM-06 - ESA4- Basic of Electrical and Electronics Engineering Laboratory	0	0	2	1
10	BS-1104	SM-07 - SC4- Engineering Physics Laboratory	0	0	2	1
11	ME-1102	MAJOR-03 -ESA5- Engineering Drawing and Graphics	0	0	2	1
12	CE-1102	MAJOR-04 -DSC2- Building Material Testing Laboratory	0	0	2	1
13	MH-1102	SM-08 -SECC2- Language Laboratory	0	0	2	1
14	MH-1103	VAC1 - NSS/NCC/Yoga (Audit Pass)	0	0	0	0
Contact Hours			13	1	12	
Total Credits						20
Semester - II						
Sl No	Course Code	Course Title	L	T	P	C
1	BS-1201	SM-9 -SC5- Engineering Mathematics-II	2	0	0	2
2	BT-1201	SM10-ESA1 - Biology for Engineers	2	0	0	2
2	CS-1201	MAJOR-05 -ESA6- Programming and Data Structure	3	0	0	3
3	CS-1202	MAJOR-06 -ESA7- AI in Engineering	2	0	0	2
5	ME-1201	MAJOR-07 -ESA8- Engineering Mechanics	3	0	0	3
6	CE-1201	MAJOR-08 -DSC3- Concrete Technology	3	0	0	3
7	MH-1201	SM-11 -ESA9- Law and Financial Aspects in Engineering	2	0	0	2
9	CE-1202	AP1-01 -VAC2- Do It Yourself (DIY)/Industry Exposure	0	0	4	2
10	BS-1202	SM-12 -SC6- Engineering Chemistry Laboratory	0	0	2	1
11	CS-1205	MAJOR-8 -ESA11- Programming and Data Structure Laboratory	0	0	2	1
12	MH-1202	SM-13 -VAC3- Indian Knowledge System (IKS)	0	0	2	1
Contact Hours			17	0	10	
Total Credits						22
Semester - III						
Sl No	Course Code	Course Title	L	T	P	C
1	BS-2101	SM-14-SC7 - Engineering Mathematics-III	3	0	0	3
2	CE-2101	MAJOR-9-DSC4 - Mechanics of Solids	3	1	0	4
3	CE-2102	MAJOR-10-DSC5 - Fluid Mechanics - I	3	0	0	3
4	CE-2103	MAJOR-11- DSC6 – Environmental Engineering - I	3	0	0	3
5	CE-2104	MAJOR-12 - DSC7- Surveying-I	3	0	0	3

6	MH-2101	SM-15 -ESA12- Introduction to Innovation and Creativity	2	0	0	2
7	CE-2105	MAJOR-13- LAB1 - Surveying Laboratory - I	0	0	2	1
8	CE-2106	MAJOR-14- LAB2 – Concrete Technology Laboratory	0	0	2	1
9	CE-2107	MAJOR-15- LAB3 - Environmental Engineering Laboratory - I	0	0	2	1
10	CE-2108	AP1-02-SECC4-Skill Development - 01	0	0	2	1
Contact Hours			17	1	8	
Total Credits						22
Semester - IV						
Sl No	Course Code	Course Title	L	T	P	C
1	CE-2201	MAJOR-16- DSC 8- Structural Analysis-I	3	0	0	3
2	CE-2202	MAJOR-17- DSC 9- Geotechnical Engineering - I	3	0	0	3
3	CE-2203	MAJOR-18- DSC 10 - Design of RCC Structures - I	3	0	0	3
4	CE-2204	MAJOR 19- DSC 11- Highway Engineering	3	0	0	3
5	CE-225A CE-225B	ELEVATIVE 01- DSE01- Design of Steel Structure-I ELEVATIVE 02- DSE02- Advanced Structural Analysis	3	0	0	3
6	CE-2206	AP1-03-VAC4 MINOR PROJECT	0	0	4	2
7	CE-2207	MAJOR-20- LAB4 – Highway Engineering Laboratory -I	0	0	2	1
8	CE-2208	MAJOR-21- LAB5 - Structural Mechanics Laboratory	0	0	2	1
9	CE-2209	MAJOR-22- LAB6 - Geotechnical Engineering Laboratory-I	0	0	2	1
10	CE-2210	AP1-04 SECC 5-Skill Development - 02	0	0	2	1
Contact Hours			15	0	12	
Total Credits						21
Semester - V						
Sl No	Course Code	Course Title	L	T	P	C
1	CE-3101	MAJOR-23- DSC12 - Fluid Mechanics – II	3	0	0	3
2	CE-3102	MAJOR-24- DSC13 - Geotechnical Engineering – II	3	0	0	3
3	CE-3103	MAJOR-25- DSC14 – Design of RCC Structure -II	3	0	0	3
4	CE-310X	OE1- Transportation Engineering	3	0	0	3
5	MH-3101	SM 16- SECC 6- Entrepreneur essential and early stage start up	3	0	0	3
6	CE-3105	AP2-01- AECC1 - Internship-I	0	0	2	1
7	CE-3106	MAJOR-26- LAB7 - Geotechnical Engineering Laboratory – II	0	0	2	1
8	CE-3107	MAJOR-27- LAB8 – Structural Engineering Laboratory	0	0	2	1
9	CE-3108	MAJOR-28- LAB9 – Fluid Mechanics Laboratory	0	0	2	1
10	CE-3109	AP2-02 SECC7 Skill Development - 03	0	0	2	1
11	CE-311H	Solid and Hazardous Waste Management	3	0	0	3*
Contact Hours			15	0	10	
• Credit for B. Tech (Hons)						
Total Credits						20

Semester - VI						
Sl No	Course Code	Course Title	L	T	P	C
1	CE-321A/ CE-321B	ELECTIVE 03-DSE03 - Surveying - II ELECTIVE 04-DSE04 – Environmental Engineering-II	3	0	0	3
2	CE-322A/ CE-322B	ELECTIVE 05-DSE05 - Design of Advanced Steel structural Elements ELECTIVE 06-DSE06- Prestressed Concrete Structure	3	0	0	3
3	CE-323A/ CE-323B	ELECTIVE 07-DSE07 – Structural System Analysis ELECTIVE 08-DSE08 - Construction Management	3	0	0	3
4	CE-324A / CE-324B	ELECTIVE-09-DSE09 - Sustainable Construction and Green Manufacturing ELECTIVE-10-DSE10- Engineering Hydrology	3	0	0	3
5	CE-320X	OE-02 - Environmental Science and Engineering	3	0	0	3
7	CE-3206	AP2-03- VAC5 - Minor Project	0	0	4	2
8	CE-3207	MAJOR-29 - LAB10 - Computer Applications in Civil Engineering	0	0	2	1
9	CE-3208	MAJOR-30- LAB11 Civil Engineering Drawing Lab- I	0	0	2	1
10	CE-325A CE-325B	ELECTIVE-11 - LAB12- Surveying Laboratory – II ELECTIVE-12 – LAB13 – Advanced Environmental Engineering Laboratory	0	0	2	1
11	CE-3210	AP2-04 SECC8 Skill Development - 04	0	0	2	1
12	CE-321H	Structural Dynamics	3	0	0	3*
Contact Hours			15	0	12	
*Credit for B. Tech (Hons)						
Total Credits						21
Semester - VII						
Sl No	Course Code	Course Title	L	T	P	C
1	CE-411A/ CE-411B	ELECTIVE-13-DSE011 - Civil Engineering Construction and Development ELECTIVE-14-DSE12- Maintenance and Rehabilitation of Structures	3	0	0	3
2	CE-412A / CE-412B/	ELECTIVE-15-DSE13- Prefabricated structures / ELECTIVE-16-DSE14- Environmental Systems Design and Modelling	3	0	0	3
	CE-413A / CE-413B/	ELECTIVE-17-DSE15 - Remote Sensing and GIS ELECTIVE-18-DSE16 - Disaster Management	3	0	0	3
3	CE-414A / CE-414B /	ELECTIVE-20- DSE18 -Traffic Engineering ELECTIVE-21- DSE19- Railway, Airport and Tunnel	3	0	0	3
4	CE-415A/ CE-415B/ CE-415C	ELECTIVE-23- DSE21- Irrigation and Hydraulic Structures ELECTIVE-24- DSE22 - Ground Water Engineering ELECTIVE-25- DSE23 - River Engineering	3	0	0	3
5	CE-416A/	ELECTIVE-26- DSE24 - Estimation, Contract and Valuation	3	0	0	3

	CE-416B	ELECTIVE-27- DSE25- Optimization in Civil Engineering (SWAYAM/NPTEL)				
6	CE-4106	AP2-05 - AECC2 - Internship-II	0	0	2	1
7	CE-4107	AP2-06- VAC6 - Major Project-I	0	0	6	3
8	CE-410H	Advanced Foundation Engineering	3	0	0	3*
Contact Hours			15	0	10	
*Credit for B. Tech (Hons)						
Total Credits						22
Semester - VIII						
Sl No	Course Code	Course Title	L	T	P	C
1	CE-421A/	ELECTIVE-28- DSE26- Environmental Impact Assessment/SWAYAM*	3	0	0	3
	CE-421OA CE-421B/ CE-421OB	ELECTIVE-29 - DSE27 – Engineering Geology/SWAYAM*	2	0	2	3
2	CE-422OA/ CE-422B/	ELECTIVE-30- DSE 28– SWAYAM Course ELECTIVE-31- DSE29- Earthquake Resistance Structures	3	0	0	3
3	CE-423OA/ CE-423B	ELECTIVE-32- DSE30 – SWAYAM Course ELECTIVE-33- DSE31- Basic of Bridge Engineering	3	0	0	3
4	CE-4202	AP2-07 VAC7 - Major Project-II	0	0	6	3
5	CE-420H	Computational Fluid Dynamics/SWAYAM	3	0	0	3*
Contact Hours			12/11	0	6/8	
*Credit for B. Tech (Hons)						
Total Credits						12

* Students who will go for Internship required for joining a job may opt for equivalent SWAYAM Course

OPEN ELECTIVES FOR OTHER DEPARTMENTS				
For Minor Degree in Civil Engineering				
SL. No	Course Code	Course Title	L-T-P	Credits
1	CE-210M	Environmental Science and Engineering	3-0-0	3
2	CE-220M	Soil Mechanics and Foundation Engineering	3-0-0	3
3	CE-310M	Structural System and Analysis	3-0-0	3
4	CE-410M	Water Resource Engineering	3-0-0	3
5	CE-320M	Transportation Engineering	3-0-0	3
6	CE-420M	Project on Minor Degree		5
Total				20

3.0 Course Structure

Semester - I						
Sl No	Course Code	Course Title	L	T	P	C
1	BS-1101	SM-01-SC1 - Engineering Mathematics-I	2	0	0	2
2	BS-1102	SM-02-SC2 - Engineering Chemistry	2	0	0	2
3	BS-1103	SM-03-SC3 - Engineering Physics	2	0	0	2
5	CE-1101	MAJOR-01 - DSC1 - Building Planning, Construction Technology and Material	3	0	0	3
6	MH-1101	SM-04 - SECC1- Communication Skill	2	0	0	2
7	EE-1102	SM-05 - ESA2- Basic of Electrical and Electronics Engineering	2	0	0	2
8	CS-1102	MAJOR-02 - ESA3- Coding Laboratory	0	1	2	2
9	EE-1103	SM-06 - ESA4- Basic of Electrical and Electronics Engineering Laboratory	0	0	2	1
10	BS-1104	SM-07 - SC4- Engineering Physics Laboratory	0	0	2	1
11	ME-1102	MAJOR-03 -ESA5- Engineering Drawing and Graphics	0	0	2	1
12	CE-1102	MAJOR-04 -DSC2- Building Material Testing Laboratory	0	0	2	1
13	MH-1102	SM-08 -SECC2- Language Laboratory	0	0	2	1
14	MH-1103	VAC1 - NSS/NCC/Yoga (Audit Pass)	0	0	0	0
Contact Hours			13	1	12	
Total Credits						20

Semester – II						
Sl No	Course Code	Course Title	L	T	P	C
1	BS-1201	SM-9 -SC5- Engineering Mathematics-II	2	0	0	2
2	BT-1201	SM10-ESA1 - Biology for Engineers	2	0	0	2
2	CS-1201	MAJOR-05 -ESA6- Programming and Data Structure	3	0	0	3
3	CS-1202	MAJOR-06 -ESA7- AI in Engineering	2	0	0	2
5	ME-1201	MAJOR-07 -ESA8- Engineering Mechanics	3	0	0	3
6	CE-1201	MAJOR-08 -DSC3- Concrete Technology	3	0	0	3
7	MH-1201	SM-11 -ESA9- Law and Financial Aspects in Engineering	2	0	0	2
9	CE-1202	AP1-01 -VAC2- Do It Yourself (DIY)/Industry Exposure	0	0	4	2
10	BS-1202	SM-12 -SC6- Engineering Chemistry Laboratory	0	0	2	1
11	CS-1205	MAJOR-8 -ESA11- Programming and Data Structure Laboratory	0	0	2	1
12	MH-1202	SM-13 -VAC3- Indian Knowledge System (IKS)	0	0	2	1
Contact Hours			17	0	10	
Total Credits						22



राष्ट्रीय प्रौद्योगिकी संस्थान अरुणाचलप्रदेश
NATIONAL INSTITUTE OF TECHNOLOGY ARUNACHAL PRADESH

(शिक्षामंत्रालय, भारत सरकारके तहत राष्ट्रीय महत्व का संस्थान)
(Institute of National Importance under Ministry of Education, Govt. of India)

CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				II		
Course Code		Course Name							Credit Structure				Marks Distribution				
									L	T	P	C	INT	MID	END	Total	
CE-1202		AP-01—VAC2- Do it Yourself or Industry Exposure							0	0	4	2	00	00	100	100	
Course Objectives		1. Students are exposed to real time civil engineering projects.							Course Outcomes	CO1	Identify and design solutions for real-life engineering problems using modern tools and prototype development.						
		2. Students acquires skills of application-oriented tasks in civil engineering								CO2	Apply teamwork and project management skills to plan, fabricate, test, and demonstrate a functional engineering project effectively.						
										CO3	Communicate project ideas, document results, present findings professionally, and reflect on challenges and learnings with ethical responsibility and lifelong learning attitude.						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	2	2	3	2	3	1	1	1	1	2	2	3	3	2	2	
2	CO2	2	2	2	3	2	1	1	1	3	3	3	2	2	2	2	
3	CO3	1	1	1	1	2	2	1	3	2	3	2	3	2	2	2	
SYLLABUS																	
No.	Content													Hours		COs	
I	An Introductory lecture on DIY Lab, Submission of Project Proposals by the Team leader One Team may be consisting of 4 members only													30		CO1	
II	Selection of Project Proposal, 3D CAD Modelling using AUTOCAD/SOLID WORKS / 3D Printed model of the proto-type, procurement of the Items / Items Issued from the DIY Lab															CO1	
III	Each team needs to make a 15 minutes presentation of your project including the following: * Problem statement * Schematic of the setup showing important components and the way they are connected * List of items used and their main specifications * Challenges faced and how you overcame the problems * Live demonstration of the project * Who did what? * Important learnings from the project															CO2	
IV	Presentation and live demonstration will be followed by individual viva. Team performance will count for 30 marks and individual viva for 20 marks. Each team member is expected to know ALL aspects of the project (e.g. circuit diagrams, part list, part specifications, code, project development, etc.) even if you have worked mainly on one aspect.															CO2, CO3	
V	Each team will have to submit a hard copy of the project report containing the following: Project title, details of team members, section and group id, motivation, work methodology, schematic of setup, list of items, item specifications, results, challenges and learnings, conclusions, and references. Evaluation of team performance will be based on quality of presentation, way you present your physical project, and quality of project report.															CO3	
Total Hours													30				
Text Books:																	
Reference Books:																	

Semester – III						
Sl No	Course Code	Course Title	L	T	P	C
1	BS-2101	SM-14-SC7 - Engineering Mathematics-III	3	0	0	3
2	CE-2101	MAJOR-9-DSC4 - Mechanics of Solids	3	1	0	4
3	CE-2102	MAJOR-10-DSC5 - Fluid Mechanics - I	3	0	0	3
4	CE-2103	MAJOR-11- DSC6 – Environmental Engineering - I	3	0	0	3
5	CE-2104	MAJOR-12 - DSC7- Surveying-I	3	0	0	3
6	MH-2101	SM-15 -ESA12- Introduction to Innovation and Creativity	2	0	0	2
7	CE-2105	MAJOR-13- LAB1 - Surveying Laboratory - I	0	0	2	1
8	CE-2106	MAJOR-14- LAB2 – Concrete Technology Laboratory	0	0	2	1
9	CE-2107	MAJOR-15- LAB3 - Environmental Engineering Laboratory - I	0	0	2	1
10	CE-2108	AP1-02-SECC4-Skill Development - 01	0	0	2	1
Contact Hours			17	1	8	
Total Credits						22

		राष्ट्रीय प्रौद्योगिकी संस्थान अरुणाचलप्रदेश NATIONAL INSTITUTE OF TECHNOLOGY ARUNACHAL PRADESH (शिक्षामंत्रालय, भारत सरकारकेतहत राष्ट्रीयमहत्वकासंस्थान) (Institute of National Importance under Ministry of Education, Govt. of India)												CURRICULUM				
Programme		Bachelor of Technology in Civil Engineering										Academic Year of Regulation			2025-29			
Department		Civil Engineering										Semester			III			
Course Code		Course Name								Credit Structure				Marks Distribution				
										L	T	P	C	INT	MID	END	Total	
CE- 2102		MAJOR-10 DSC5- Fluid Mechanics - I								3	0	0	3	20	30	50	100	
Course Objectives		1. To understand the basic fluid properties								Course Outcomes	CO1	Study various properties of fluid						
		2. To study the fluid kinematics including stream lines and path lines.									CO2	Solve practical problems involving hydrostatic pressure and stability of floating bodies						
		3. To apply the concepts of continuity and momentum principles in fluid mechanics									CO3	Apply the governing equations for mass and momentum and utilize them in practical problem						
		4. To study about the fluid flow through pipes and dimensional analysis									CO4	Analyze the flow in pipe and flow measurement methods						
											CO5	Apply dimensional analysis for fluid problems to utilize it for model testing of fluid mechanics						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3		
1	CO1	3	3	0	0	0	0	1	0	0	0	0	2	3	0	0		
2	CO2	3	3	2	0	0	0	0	0	0	0	0	3	3	0	0		
3	CO3	3	3	2	0	0	0	0	0	0	0	0	3	3	0	0		
4	CO4	3	3	2	0	0	0	0	0	0	0	0	3	3	0	0		
5	CO5	3	3	1	0	0	0	0	0	0	0	0	3	3	0	0		
SYLLABUS																		
No.	Content													Hours		COs		
I	Introduction: Purpose of study of fluid mechanics in the fields of Civil and other Engineering. Fundamental difference between a solid and a fluid, constituent relationship for solids and fluids, conservation principles applied in fluid mechanics.													3		CO1		
II	Properties of fluids: viscosity, compressibility, ideal and real fluids, Newtonian and non-Newtonian fluids, surface tension													3		CO1		
III	Pressure at point: Pascal's law, Stress at a point, Variation of pressure with elevation in compressible and incompressible fluids, hydrostatic law, Pressure measurement, piezometers and manometers, buoyancy, stability of submerged and floating bodies. Fluid flow: with reference to translation, rotation and deformation, concept of continuum, control mass & control volume approach, Reynolds transport theorem.													8		CO2		
IV	Velocity field: one & two-dimensional flow analysis, circulation and vorticity, stream function and velocity potential function, potential flow, equipotential lines, standard flow patterns, combination of flow patterns, flow net method, use and limitations.													7		CO2		
V	Forces exerted in a fluid flow: derivation of continuity equation and Euler’s equation, Bernoulli’s equation and its applications, Momentum equation and its applications.													5		CO3		
VI	Measurement of flow in pipes: orifice, mouthpiece and venturimeter, notches, Moody diagram, friction factor													6		CO4		
VII	Laminar flow and its characteristics: Navier-Stokes equation - exact solutions, Laminar flow between parallel plates, Laminar flow through pipes, Hazen-Poiseuille equation, Reynolds experiment, head loss in flow through pipes, Darcy Weisbach equation, losses in pipe transitions, Turbulence, Prandtl’s mixing length theory													8		CO4		
VII	Dimensional Analysis: Dimensional homogeneity, Non-Dimensional parameter, Π theorem, dimensional analysis, choice of variables, Reyleigh methods.													5		CO5		
Total Hours													45					
Text Books:																		
1. John. M. Cimbala and Yunus A. Cengel, Fluid Mechanics: Fundamentals and Applications, McGraw-Hill Publication, 2020																		
2. F M White, Fluid Mechanics, Tata McGraw Hill Publication, 2011																		
3. Ethirajan Rathakrishnan, Fluid Mechanics: An Introduction, PHI Publication, 2012.																		
Reference Books:																		
1. Robert W. Fox, Philip J. Pritchard, Alan T. McDonald, Introduction to Fluid Mechanics, Wiley India Edition, 2011..																		
2. Bidya Sagar Pani, Fluid Mechanics: A Concise Introduction, PHI Publication, 2016																		



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CURRICULUM

Programme		Bachelor of Technology in Civil Engineering								Academic Year of Regulation				2025-29			
Department		Civil Engineering								Semester				III			
Course Code		Course Name						Credit Structure				Marks Distribution					
								L	T	P	C	INT	MID	END	Total		
CE- 2104		MAJOR-12 - DSC7 - Surveying - I						3	0	0	3	20	30	50	100		
Course Objectives		1. To understand the importance of surveying in the field of civil engineering.						Course Outcomes	CO1	Understand the principles, types and methods of surveying, to apply them in practice with minimum or no error							
		2. To understand the methods of chain and compass surveying							CO2	Analyse and rectify the errors in the horizontal-linear and horizontal-angular measurements to calculate area.							
		3. To study the concepts of levelling and contouring							CO3	Analyse and evaluate the measurements in levelling to obtain reduced levels, contour lines and earthwork estimation.							
		4. Understand the concepts of theodolite-based surveying.							CO4	Analyse and evaluate the horizontal and vertical coordinates using a theodolite							
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	2	2							1				3			
2	CO2	3	3							1				2			
3	CO3	3	3							1				3			
4	CO4	3	3			1				1				3			
SYLLABUS																	
No.	Content													Hours		COs	
I	Introduction: Definition of surveying, primary divisions of surveying, object and classification of surveying, principles of surveying, approximate methods of chain and tape surveying, errors in tape measurements and their corrections, chaining on flat and sloping ground, obstacle in chaining, direct and indirect methods of ranging, methods of traversing, principle basic definitions, bearings and meridians, prismatic compass, surveyors compass, azimuthal and quadrantal bearing systems, true north and magnetic north, magnetic declination, local attraction and its correction.													45		CO1	
II	Levelling and contouring: Definition of terms, principles of levelling, types of levels, levelling staffs, booking and reduction in field book, balancing of sights, errors curvature and refraction, distance of visible horizon, reciprocal levelling, and its merits, contour, contour interval, horizontal equivalent, contour gradient, factors affecting contour interval, characteristics of contours, direct and indirect methods of contouring, uses of contour maps.															CO2	

III	Plane table surveying: Principles, instruments and other accessories, methods used: radiation, traversing, resection, intersection and their uses, two-point and three-point problem.		CO2
IV	Theodolite: Vernier and microscopic theodolite, construction, temporary and permanent adjustments, measurements of horizontal and vertical angles, methods of repetitions and reiteration, sources of errors, checks in traversing, omitted measurements		CO4
V	Area: Measurement of Area, Computation of area by Geometrical Figure, Area of offsets, Area from co- ordinates, Area by planimeter, Digital Planimeter Volume: Definitions, Methods of measurement of volume. Measurement from cross-sections, Types of cross- sections and areas, prismoidal correction, curvature corrections		CO3
Total Hours		45	
Text Books:			
1. Duggal S.K., Surveying Volume-I, Tata McGraw Hill Publisher, New Delhi, 2017.			
2. Arora. K.R., Surveying Volume-I, Standard Publishers Distributors, 2019.			
3. Punmia, B.C, Jain A. K, Jain A.K., Surveying Volume-I, Laxmi Publications, 2016			
Reference Books:			
1. Agor R., A Textbook of Surveying and Levelling, Khanna Publishers, New Delhi, 2015.			
2. Kanetkar T P, Surveying and Levelling, Pune Vidyarthi Griha Prakashan, Pune, 2006			



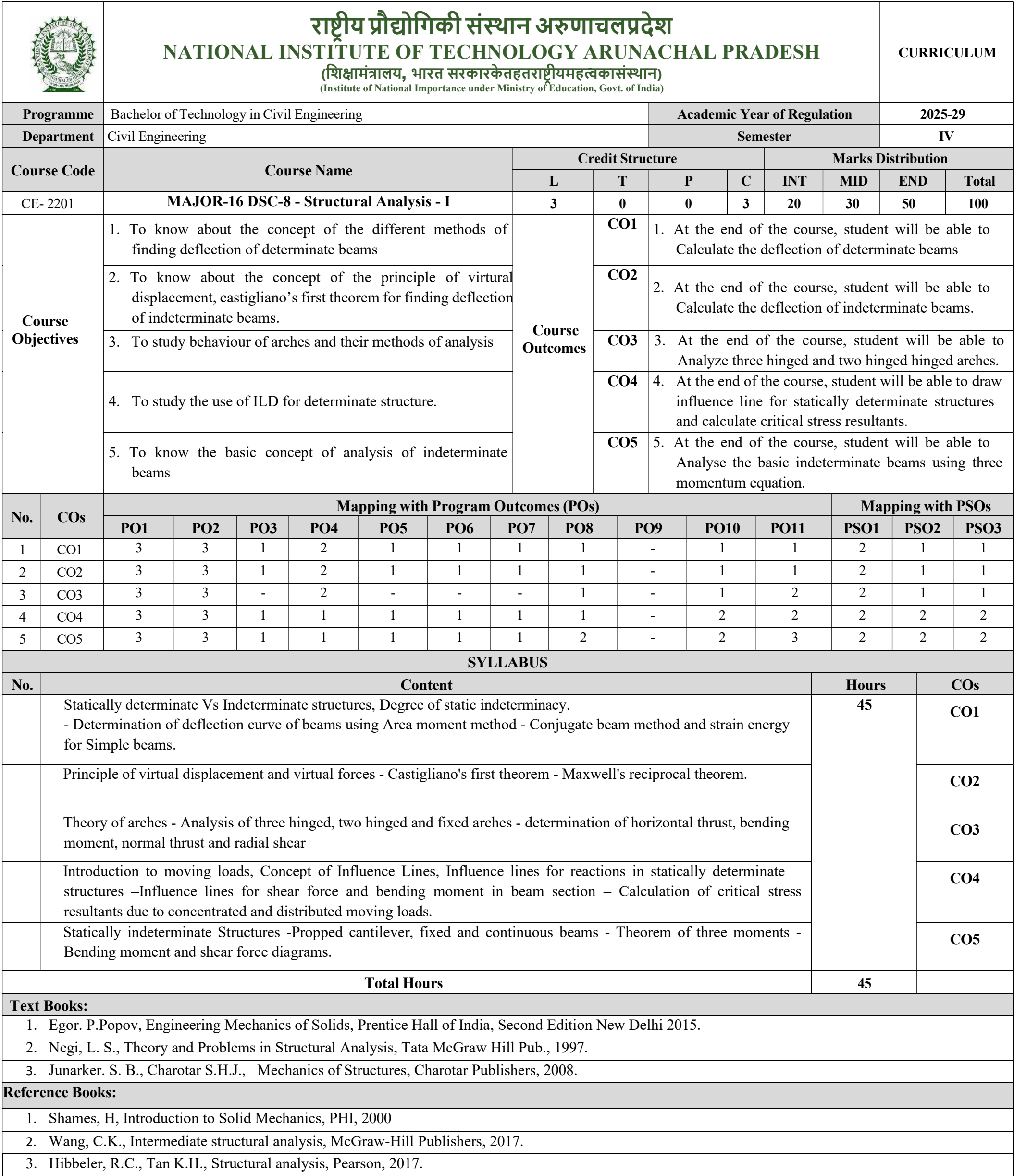
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CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				III		
Course Code		Course Name							Credit Structure				Marks Distribution				
									L	T	P	C	INT	MID	END	Total	
CE- 2105		MAJOR- 13 – LAB1 -Surveying Laboratory - I							0	0	2	1	-	-	100	100	
Course Objectives		1. To study the basic information about the equipment used in surveying.							Course Outcomes	CO1	Measure the linear distance and horizontal angle using suitable method						
		2. To understand the measuring techniques used for linear and angular measurements.								CO2	Plot the longitudinal and cross sections of the collected data.						
		3. To perform levelling, contouring and theodolite survey.								CO3	Conduct Plane table surveying.						
										CO4	Measure the horizontal angle and vertical angle.						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	2	2			1	1	1		1				2			
2	CO2	3	3					1		1				2			
3	CO3	3	3					1		1				3			
4	CO4	3	3			1		1		1				3			
SYLLABUS																	
No.	Content													Hours		COs	
I	To practice Chaining and Tape methods of ranging and to measure the distances between two points using Direct and Indirect ranging.													30		CO1	
II	To measure bearings of sides of traverse with prismatic compass and computation of included angles.															CO2	
III	To carry out profile levelling of a given section and plot the longitudinal and cross sections using rise and fall method															CO3	
IV	To carry out profile levelling of a given section and plot the longitudinal and cross sections using height of the instrument.															CO3	
V	To carry out the differential levelling in the field.															CO3	
VI	To prepare the contour map of an area by the method of radial lines using dumpy level.																

VII	To carry out Plane table survey by the method of radiation and intersection.		CO3
VIII	To determine the horizontal angle and vertical angle of a given point using Theodolite.		CO4
Total Hours		30	
Text Books:			
1. Duggal S.K., Surveying Volume-I, Tata McGraw Hill Publisher, New Delhi, 2017. 2. Arora. K.R., Surveying Volume-I, Standard Publishers Distributors, 2019. 3. Punmia, B.C, Jain A. K, Jain A.K., Surveying Volume-I, Laxmi Publications, 2016. 4. Surveying Manual			
Reference Books:			
1. Punmia, B.C, Jain A. K, Jain A.K., Surveying Volume-I & II, Laxmi Publications, 2016. 2. Chandra A. M., Higher Surveying, New Age International Publishers, 2007. 3. James A, Edward M, Surveying Theory and Practice, Tata Mc Graw Hill, 2012. 4. Charles D.G., Paul R.W., Elementary Surveying, Prentice Hall, 2014.			

Semester – IV						
Sl No	Course Code	Course Title	L	T	P	C
1	CE-2201	MAJOR-16- DSC 8- Structural Analysis-I	3	0	0	3
2	CE-2202	MAJOR-17- DSC 9- Geotechnical Engineering - I	3	0	0	3
3	CE-2203	MAJOR-18- DSC 10 - Design of RCC Structures - I	3	0	0	3
4	CE-2204	MAJOR 19- DSC 11- Highway Engineering	3	0	0	3
5	CE-225A CE-225B	ELEVATIVE 01- DSE01- Design of Steel Structure-I ELEVATIVE 02- DSE02- Advanced Structural Analysis	3	0	0	3
6	CE-2206	AP1-03-VAC4 MINOR PROJECT	0	0	4	2
7	CE-2207	MAJOR-20- LAB4 – Highway Engineering Laboratory -I	0	0	2	1
8	CE-2208	MAJOR-21- LAB5 - Structural Mechanics Laboratory	0	0	2	1
9	CE-2209	MAJOR-22- LAB6 - Geotechnical Engineering Laboratory-I	0	0	2	1
10	CE-2210	AP1-04 SECC 5-Skill Development - 02	0	0	2	1
Contact Hours			15	0	12	
Total Credits						21





CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				IV		
Course Code		Course Name							Credit Structure				Marks Distribution				
									L	T	P	C	INT	MID	END	Total	
CE- 2203		MAJOR-18-DSC10- Design of RCC Structures-I							3	0	0	3	20	30	50	100	
Course Objectives		1. To study the stress strain behaviour of steel and concrete.							Course Outcomes	CO1	Design the Reinforced Concrete beams using limit state and working stress methods.						
		2. To understand the concept of working stress and limit state methods.								CO2	Design Reinforced Concrete slabs.						
		3. To gain the knowledge of limit state design for flexure, shear, torsion, bond, and anchor.								CO3	Design the Reinforced Concrete Columns and footings.						
		4. To understand the behaviour of columns subjected to eccentric load and use of interaction diagrams.								CO4	Design structures for serviceability.						
		5. To study the design of RC footings in foundation system.								CO5	Design stair cases and other minor structural elements of a RC building.						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	3	2	3	1	2	1	2	1	1	2	1	2	3	3	3	
2	CO2	3	2	3	1	2	1	2	1	1	2	1	2	3	3	3	
3	CO3	3	2	3	1	2	1	2	1	1	2	1	2	3	3	3	
4	CO4	3	2	3	2	2	2	3	2	1	2	1	2	3	3	3	
5	CO5	3	2	3	1	2	1	2	1	1	2	1	2	3	3	3	
SYLLABUS																	
No.	Content													Hours		COs	
I	Review of Concrete making materials- Structural concrete- Grades- properties of Concrete- Modulus of elasticity-flexural strength-Characteristic and Design Values Partial safety factor- Design codes and specifications, Loads, Serviceability, Safety, design basis, Strength design, Allowable stress design, Safety provisions, required strength, Design strength.													3		CO1	
II	Methods of design - Aims of design- RCC- Limit State method- Assumptions- Stress Strain behavior of Steel and Concrete- Stress block parameters- Working stress method-comparison of design process.													5		CO1	
III	Design of Singly Reinforced Beams - Analysis of Singly Reinforced RC Section- Neutral Axis-Balanced-Under Reinforced-Over Reinforced Sections- Moment of Resistance- Design parameters- Design examples.													5		CO1	
IV	Design of Doubly Reinforced Beams - Necessity of Doubly Reinforced sections- Analysis of Doubly Reinforced RC Section- Moment of Resistance- Design parameters- Design. Shear and Bond design of RCC - Shear forces in RC-Shear Resistance of RC- Truss analogy- design of Vertical Stirrups-Bent-up bars- Limitation- Bond failure in RC- Check for bond resistance- Development Length-Design for shear and bond.													5		CO1	
V	Design of Flanged Beams - Analysis of flanged RC section- Singly and Doubly Reinforced-Effective flange width- Moment of Resistance- design examples.													4		CO1	
VI	Design of RCC Slabs - Design of One- and Two-way slabs- Effect of edge conditions, Moment of resistance-Torsion reinforcement at corners- Design examples.													4		CO2	
VII	Design of Continuous Slab and Beams - Effect of continuity- analysis of continuous beam/slab- Moment and shear coefficients for continuous beam/slab- Critical sections.													4		CO2	
VIII	Design of RC Columns - Design principles of RC columns- Assumptions- Rectangular and Circular columns- Helical reinforcement- Minimum Eccentricity-Use of Interaction diagrams for Axial load and Moment.													4		CO3	
IX	Design of RC Footings - RC footings-Minimum depth of footing- Safe bearing capacity Design for Bending-Shear in One way and Shear in Two way- Transfer of load at base of column.													4		CO3	
X	Design for Serviceability - Concept of Serviceability- Deflection- Span to depth ratio- short term-long term deflection due to Shrinkage, Creep- Cracking-Crack width calculation.													4		CO4	
XI	Design of Miscellaneous RC Structures - Design of Stair case, lintels/chajas													3		CO5	
Total Hours													45				
Text Books:																	
1. Varghese, P. C., Limit state design of Reinforced Concrete. PHI Learning Pvt. Ltd., 2008.																	
2. N Krishna Raju, Design of Reinforced Concrete Structures, CBS Publishers and Distributers Pvt Ltd., 2016																	
3. Punmia, B. C., Jain, A. K., Jain, A. K., Limit state design of reinforced concrete., Laxmi Pub. Pvt Ltd, 2016																	
4. BIS IS 456: Plain and Reinforced Concrete Code of Practice, 2000.																	
Reference Books:																	
1. Unnikrishna P.S, Reinforced Concrete Design, McGraw Hill Pub, 2009.																	
2. Narayanan S., Design of reinforced concrete structures. Oxford University Press, 2013.																	
3. Park, R., Paulay, T., Reinforced Cement Concrete Structures, Wiley India Pvt. Ltd, 2009.																	
4. M.L. Gambhir, Design of Reinforced Concrete Structures, PHI Learning Private Ltd., 2012																	
5. N. Subramanian, Design of Reinforced Concrete Structures, Oxford University Press, 2013																	



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CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				IV		
Course Code		Course Name							Credit Structure				Marks Distribution				
									L	T	P	C	INT	MID	END	Total	
CE- 2204		MAJOR 19- DSC 11 - Highway Engineering							3	0	0	3	20	30	50	100	
Course Objectives		1. To introduce the historical road development activities in India.							Course Outcomes	CO1	Understand the history of road development and planning in India						
		2. To highlight the important factors in road planning and elements of highway alignment.								CO2	To design the highway geometric elements.						
		3. To learn the concept of highway geometric design, pavement materials and pavement design.								CO3	Analyze the suitability of materials for construction of pavements.						
		4. To impart the knowledge on basic principles of traffic engineering.								CO4	Design of flexible and rigid pavements.						
										CO5	Explain the principles of traffic engineering and its importance						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	1	0	1	0	0	2	1	0	0	0	0	0	3	0	0	
2	CO2	3	2	3	2	0	2	0	0	0	0	0	3	3	1	2	
3	CO3	3	2	1	2	0	0	0	1	0	0	0	3	3	0	0	
4	CO4	3	2	3	3	0	0	0	1	0	0	0	3	3	3	3	
5	CO5	3	2	3	3	0	0	0	0	0	0	0	3	3	2	2	
SYLLABUS																	
No.	Content													Hours		COs	
I	Road development and planning: Brief history of road development, Road cross section, necessity of transportation planning, classification of roads, road patterns, planning surveys, saturation system, highway planning in India, road development plans. Introduction to PMGSY for improvement of rural roads.													45		CO1	
II	Highway location and alignment: Basic requirements of an ideal alignment and factors controlling, engineering survey for highway location, drawing and reports, highway projects.															CO2	
III	Highway geometric design: Highway cross section elements, sight distances, Design of horizontal alignment, Transition															CO2	

	curves and vertical alignment.		
IV	Pavement materials: Soils, Aggregates and their characteristics, bituminous materials and mixtures, Portland cement concrete, Experimental characterization of various pavement and subgrade materials, Application of Superpave method of pavement material characterization.		CO3
V	Pavements design: Design factors, Design of flexible pavements, CBR, GI and Bur mister methods, Design of rigid pavements		CO4
VI	Traffic Engineering: Introduction - Road user, vehicle and traffic characteristics. Speed and volume studies. Design of at-grade intersections – roundabouts and signalized intersections. Traffic regulation and control, traffic signs and road markings. Parking Facilities -Multimodal transportation - ITS and automated highways		CO5
Total Hours		45	
Text Books:			
1. Khanna K S., Justo C E G., Veeragavan A., Highway Engineering, Nem Chand & Bros, 2020.			
2. L. R. Kadiyali and N.B. Lal ‘Principles and Practices of Highway Engineering’, Khanna, Publishers, 7th Edition 2019.			
3. Kadiyali, L. R., “Traffic Engineering and Transportation Planning”, Khanna, Publishers, 2008.			
4. Venkatramiah C., Transportation Engineering (Highway Engineering), Orient Blackswan private limited, 2015.			
1. Papacostas S C., Prevedouros D P., Transportation Engineering, PHI publishers, 2016.			
2. Chakroborty P., Principles of Transportation Engineering, PHI publishers, 2020.			
3. IRC 73- 2023, “Geometric Design Standards for Rural (Non-Urban) Highways”.			
4. IRC 37- 2018, “Guidelines for the Design of Flexible Pavements”.			
5. IRC 58-2015, “Guidelines for the Design of Plain Joined Rigid Pavements for Highways”.			
6. IRC SP 41-1994, “Guidelines for the Design of At-Grade Intersections in Rural and Urban Areas”.			
7. IRC SP 72-2015, “Guidelines for The Design of Flexible Pavements for Low Volume Rural Roads”.			

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Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation			2025-29		
Department		Civil Engineering									Semester			IV		
Course Code		Course Name				Credit Structure				Marks Distribution						
						L	T	P	C	INT	MID	END	Total			
CE-225B		ELEVTIVE 02- DSE02- Advanced Structural Analysis				3	0	0	3	20	30	50	100			
Course Objectives		1. To understand the influence line concepts for indeterminate structures.				Course Outcomes	CO1	1. At the end of the course, student will be able to: Demonstrate the concepts of qualitative influence line diagram for continuous beams and frames.								
		2. To understand the methods of analysis of intermediate trusses for external loads, lack of fit and thermal effect.					CO2	2. At the end of the course, student will be able to: Design Apply the methods for analysis indeterminate truss.								
		3. To study behaviour of arches and their methods of analysis.					CO3	3. At the end of the course, Student will be able to: Demonstrate the behavior of arches and their methods of analysis.								
		4. To know the concept and analysis of cable stayed bridge.					CO4	4. At the end of the course, student will be able to: Analyse cable suspension bridges.								
		5. To study the multi storey frames subjected to gravity loads and lateral loads.					CO5	5. At the end of the course, student will be able to: analyse multistorey frame subjected to gravity loads and lateral loads.								
No.	COs	Mapping with Program Outcomes (POs)											Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	
1	CO1	3	3	-	2	-	-	-	-	1	2	1	2	1	1	
2	CO2	3	2	-	3	-	-	-	-	1	2	1	2	1	1	
3	CO3	3	3	-	2	-	-	-	-	1	2	1	2	1	1	
4	CO4	3	2	-	3	-	-	-	-	1	2	1	2	1	1	
5	CO5	3	2	-	3	-	-	-	-	1	2	1	2	1	1	
SYLLABUS																
No.	Content												Hours	COs		
	Influence lines - Maxwell Betti's theorem - Muller Breslau's principle and its application. Influence lines for continuous beams and single bay, single storey portals with prismatic members.												45	CO1		
	Analysis of plane truss with one or two redundants - trusses with lack of fit - Thermal stresses - Settlement of supports Trussed beams.													CO2		
	Theory of arches - Analysis of three hinged, two hinged and fixed arches - influence lines, rib shortening, settlement and temperature effects.													CO3		
	Analysis of cables - Suspension bridges with three and two hinged stiffening girders -influence lines.													CO4		
	Analysis of multistorey frames for gravity and lateral loads by approximate methods -Substitute frame - Portal and Cantilever methods - Introduction to earthquake load.													CO5		
Total Hours												45				
Text Books:																
1. Punmia, B.C, Theory of Structures, Laxmi Publications, 2000.																
2. Timoshenko, S.P.,Young, D.H., Theory of Structures, Tata McGraw Hill, 1983.																
3. Wang. C.K., Intermediate Structural Analysis, International Text Book Co, 1983.																
Reference Books:																
1. Hibbeler. R.C., Structural Analysis, Pearson Education (Singapore) Ptc. Ltd., Indian Branch, 2002.																
2. Jindal. R.L, Indeterminate Structures, Chan Tea, New Delhi, 2000.																
3. Egor. P.Popov, Engineering Mechanics of Solids, Prentice Hall of India, Second Edition New Delhi 2015.																
4. Negi, L. S., Theory and Problems in Structural Analysis, Tata McGraw Hill Pub., 1997.																
5. Junarker. S. B., Charotar S.H.J., Mechanics of Structures, Charotar Publishers, 2008.																

1. Khanna K S., Justo C E G., Veeragavan A., Highway Engineering, Nem Chand & Bros, 2020.

2. Khanna K S., Justo C E G., Veeragavan A., Highway Materials and Pavement Testing Manual, Nem Chand & Bros, 2013.

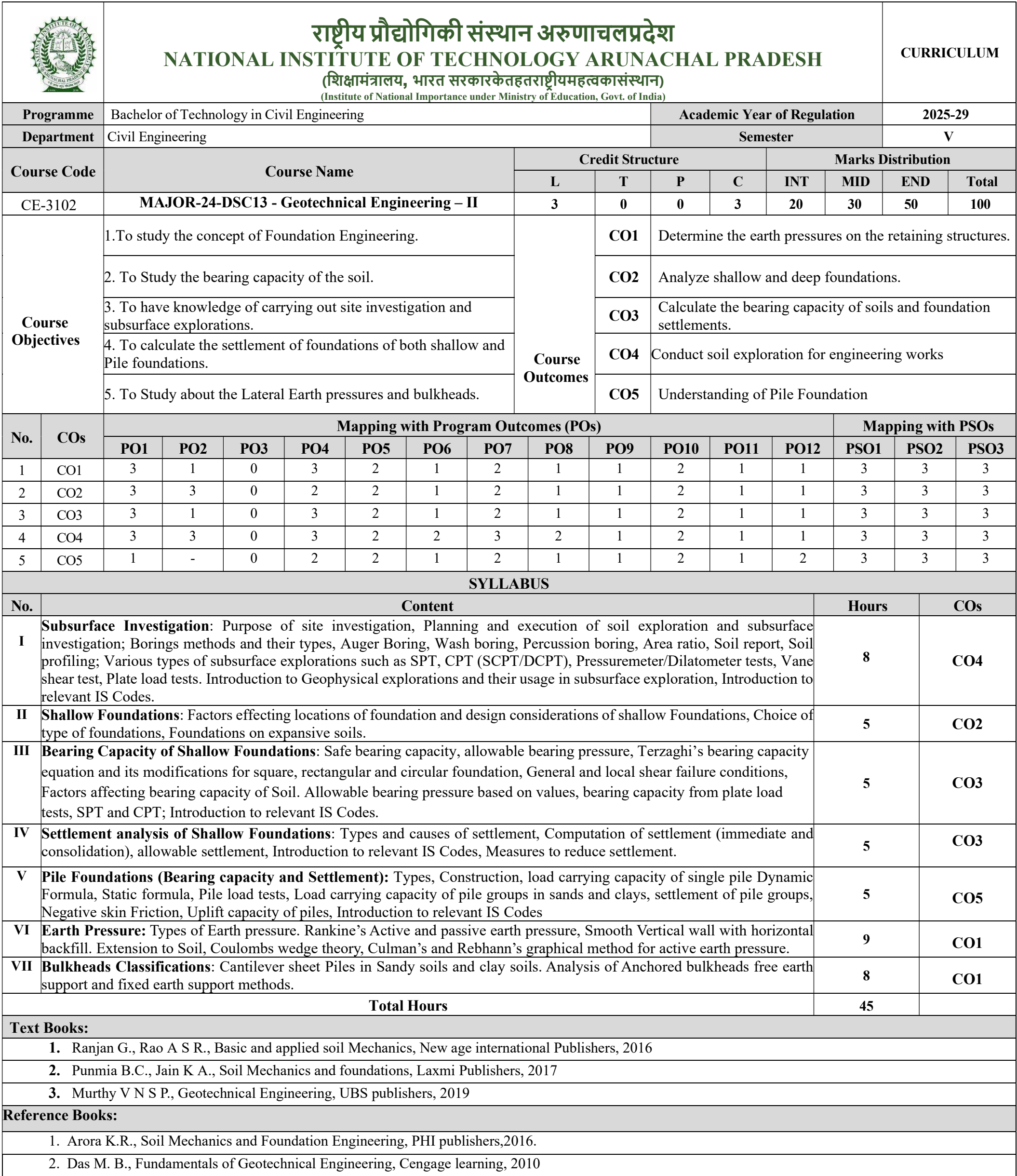
Reference Books:

1. Relevant BIS Standards.

2. Highway Engineering Lab Manual.

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Programme		Bachelor of Technology in Civil Engineering										Academic Year of Regulation				2025-29																	
Department		Civil Engineering										Semester				IV																	
Course Code		Course Name								Credit Structure				Marks Distribution																			
										L		T		P		C		REPORT		VIVA		EXAM		Total									
CE-2208		MAJOR-21- LAB5 - Structural Mechanics Laboratory								0		0		2		1		20		30		50		100									
Course Objectives		1. To find out the B.M and shear force in beams.								Course Outcomes		CO1		Students will know about the behaviour of column under buckling load.																			
		2. To study the behaviour of column under buckling for different material and end conditions																															
		3. To study the behaviour of three hinged arch and suspension bridge										CO2		Students will have knowledge about the nature of forces in truss.																			
		4. To find the member force in truss.																				CO3		Students will have knowledge about the three hinged arch, suspension bridge.									
No.		COs		Mapping with Program Outcomes (POs)												Mapping with PSOs																	
				PO1		PO2		PO3		PO4		PO5		PO6		PO7		PO8		PO9		PO10		PO11		PO12		PSO1		PSO2		PSO3	
1		CO1		3		1		1		1		2		2		1		1		3		1		1		2		3		3		3	
2		CO2		3		1		1		1		2		2		1		1		3		1		1		2		3		3		3	
3		CO3		3		1		1		1		2		2		1		1		3		1		1		2		3		3		3	
SYLLABUS																																	
No.		Content												Hours				COs															
I		Bending Moment and Shear force in Beams Loaded with concentrated forces.												2				CO1															
II		Experimental investigation of a symmetrical or unsymmetrical three hinged arch under loading.												2				CO1															
III		Deflection of trusses under loads.												2				CO1															
IV		Various forms of buckling by Euler strut theory.												2				CO1															
V		Determination of the buckling force for the case of an elastic joint and elastic fixed end support.												2				CO1															
VI		Demonstration of the behaviour of a typical suspension bridge.												2				CO3															
VII		Measurement of the bar forces in various single plan trusses.												2				CO2															
VII		Determine of elastic line under different loads and under different support condition.												4				CO3															
IX		Distribution of forces in trusses.												2				CO2															
X		Buckling behaviour of bars of different materials.												4				CO1															
XI		Verification of stress hypothesis.												2				CO1															
XII		Deformation of bars under bending or torsion.												2				CO1															
XIII		Experimental investigation of a parabolic arch under loading.												2				CO3															
Total Hours												30																					
Text Books:																																	
1. Punmia, B. C., Jain, A. K., Jain, A. K., Strength of Materials and Theory of Structures, Laxmi Publications, 1992.																																	
2. Wang C, Chu-Kia. Intermediate structural analysis. McGraw-Hill Publishers, 2017.																																	
Reference Books:																																	
1. Jain A, Reddy S., Basic Structural Analysis, Tata McGraw-Hill Education, New Delhi, 1994.																																	
2. Norris, C. H., Wilbur, J. B., Utku, S., Elementary structural analysis. McGraw-Hill Science, 1976.																																	
3. Neal, B. G., The plastic methods of structural analysis, Chapman and Hall, 1966.																																	

Semester – V						
Sl No	Course Code	Course Title	L	T	P	C
1	CE-3101	MAJOR-23- DSC12 - Fluid Mechanics – II	3	0	0	3
2	CE-3102	MAJOR-24- DSC13 - Geotechnical Engineering – II	3	0	0	3
3	CE-3103	MAJOR-25- DSC14 – Design of RCC Structure -II	3	0	0	3
4	CE-310X	OE1- Transportation Engineering	3	0	0	3
5	MH-3101	SM 16- SECC 6- Entrepreneur essential and early stage start up	3	0	0	3
6	CE-3105	AP2-01- AECC1 - Internship-I	0	0	2	1
7	CE-3106	MAJOR-26- LAB7 - Geotechnical Engineering Laboratory – II	0	0	2	1
8	CE-3107	MAJOR-27- LAB8 – Structural Engineering Laboratory	0	0	2	1
9	CE-3108	MAJOR-28- LAB9 – Fluid Mechanics Laboratory	0	0	2	1
10	CE-3109	AP2-02 SECC7 Skill Development - 03	0	0	2	1
11	CE-311H	Solid and Hazardous Waste Management	3	0	0	3*
Contact Hours			15	0	10	
• Credit for B. Tech (Hons)						
Total Credits						20



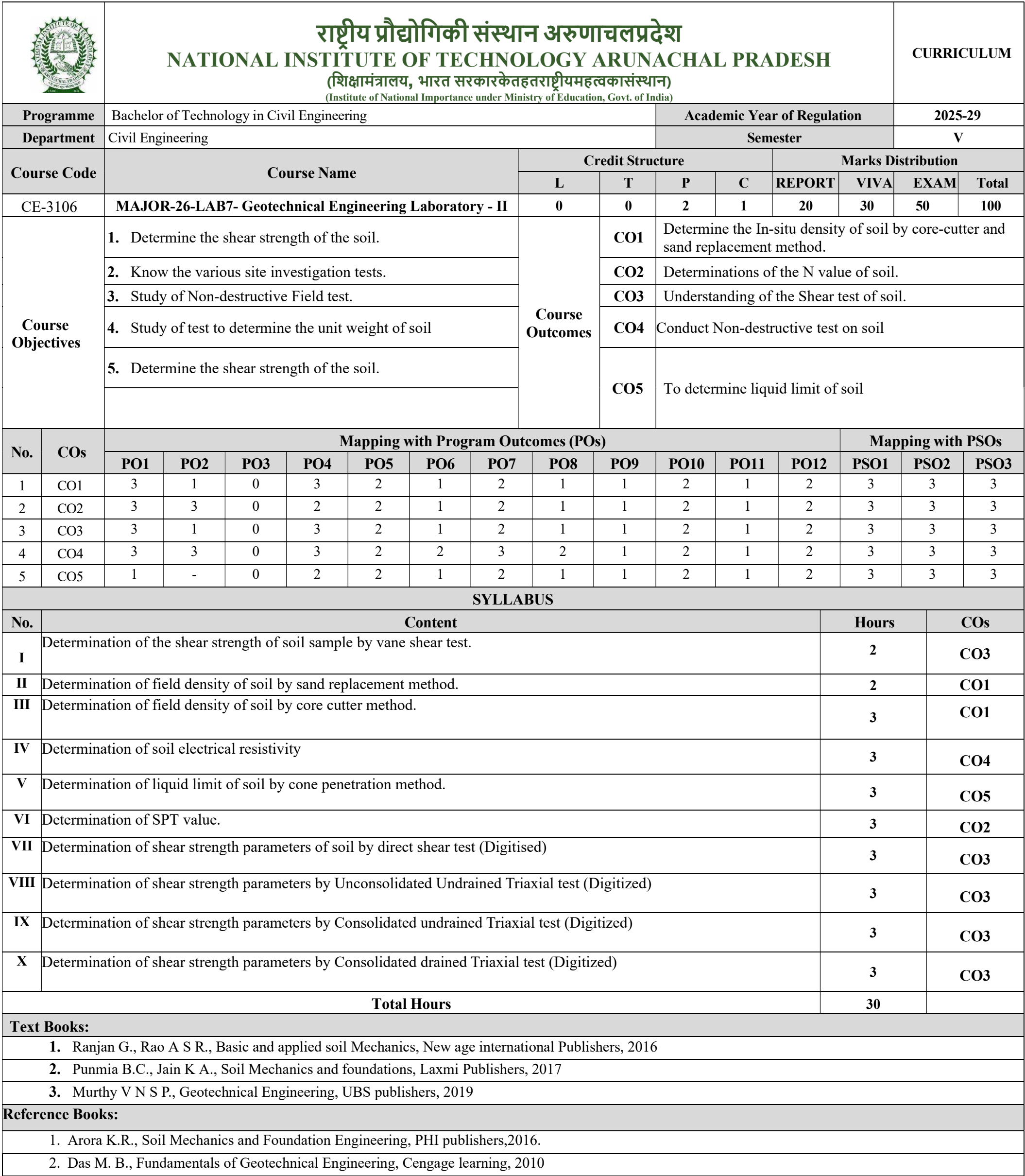


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 (शिक्षामंत्रालय, भारत सरकारके तहत राष्ट्रीय महत्त्व का संस्थान)
 (Institute of National Importance under Ministry of Education, Govt. of India)

CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				V		
Course Code		Course Name							Credit Structure					Marks Distribution			
									L	T	P	C	INT	MID	END	Total	
CE- 310X		OE1- Transportation Engineering							3	0	0	3	20	30	50	100	
Course Objectives		1. Provide a systematic understanding of the causes and motivations of Highway location, planning and geometric design.							Course Outcomes	CO1	Students will idea about the history of road development and planning in India.						
		2. To have idea about road planning and development.								CO2	Students will be confident in flexible and rigid pavement designing						
		3. To have idea about the pavement design and pavement materials.								CO3	Students will have idea about the construction of highways.						
		4. To have idea about the hill roads and highway maintenance.								CO4	Students will be able to do planning and development of hill road.						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	1	2	2	1	0	0	0	0	0	0	0	1	3	2	0	
2	CO2	1	2	3	1	0	0	0	0	0	0	0	1	3	2	2	
3	CO3	3	2	3	1	1	0	0	0	0	0	0	1	3	2	2	
4	CO4	1	2	3	1	1	0	0	0	0	0	0	1	3	2	0	
SYLLABUS																	
No.	Content													Hours		COs	
I	Road development and planning: Brief history of road development, Road cross section, necessity of transportation planning, classification of roads, road patterns, planning surveys, saturation system, highway planning in India, road development plans.															CO1	
II	Highway location and alignment: Basic requirements of an ideal alignment and factors controlling, engineering survey for highway location, drawing and reports, highway projects.															CO1	
III	Highway geometric design: Highway cross section elements, sight distances, Design of horizontal alignment, Transition curves and vertical alignment.															CO2	
IV	Pavements design: Design factors, Design of flexible pavements, CBR, GI and Burmister methods, Design of rigid pavements.															CO3	

V	Pavement materials: Soils, Aggregates and their characteristics, bituminous materials and mixtures, Portland cement concrete.		CO3
VI	Hill roads: General considerations, alignment, geometric design and construction, drainage, and maintenance problems in hill roads. Highway maintenance: Pavement failures, maintenance of highway pavement, evaluation and strengthening of existing pavements.		CO4
Total Hours		45	
Text Books:			
1. Khanna K S., Justo C E G., Veeragavan A., Highway Engineering, Nem Chand & Bros, 2020			
2. Kadiyali R. L., Transportation Engineering, Khanna Publishers, 2021			
3. enkatramiah C., Transportation Engineering (Highway Engineering), Orient Blackswan private limited, 2015.			
Reference Books:			
1. Papacostas S C., Prevedouros D P., Transportation Engineering, PHI publishers,2016			
2. Chakroborty P., Principles of Transportation Engineering, PHI publishers,2020.			





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CURRICULUM

Programme	Bachelor of Technology in Civil Engineering
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Academic Year of Regulation

2025-26

Department	Civil Engineering
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Semester

V

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	REPORT	VIVA	EXAM	Total
CE- 3107	MAJOR-27- LAB8- Structural Engineering Laboratory	0	0	2	1	20	30	50	100
Course Objectives	1. To study the B.M and shear force in beams.	Course Outcomes	CO1	1. At the end of the course, student will be able to Evaluate the bending moment and shear force for simple beams					
	CO2		2. At the end of the course, student will be able to Understand about the behaviour of column under buckling load.						
	CO3		3. At the end of the course, student will be able to Analyse the nature of forces in truss						
	CO4		4. At the end of the course, student will be able to Understand about the behaviour of three hinged arch and suspension bridge.						

No.	COs	Mapping with Program Outcomes (POs)											Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	CO1	3	3	-	-	-	-	-	-	-	-	1	-	-	3
2	CO2	3	3	-	-	-	-	-	-	-	-	1	-	-	3
3	CO3	3	3	-	-	-	-	-	-	-	-	1	-	-	3
4	CO4	3	3	-	-	-	-	-	-	-	-	1	-	-	3

SYLLABUS

No.	Content	Hours	COs
	1. Bending Moment and Shear force in Beams Loaded with concentrated forces. 2. Experimental investigation of a symmetrical or unsymmetrical three hinged arch under loading. 3. Deflection of trusses under loads. 4. Various forms of buckling by Euler strut theory. 5. Determination of the buckling force for the case of an elastic joint and elastic fixed end support. 6. Demonstration of the behaviour of a typical suspension bridge. 7. Measurement of the bar forces in various single plan trusses. 8. Determine of elastic line under different loads and under different support condition. 9. Distribution of forces in trusses. 10. Buckling behaviour of bars of different materials. 12. Deformation of bars under bending or torsion. 13. Experimental investigation of a parabolic arch under load	30	CO1, CO2, CO3, CO4

Total Hours

30

Text Books:

1. Punmia, B. C., Jain, A. K., Jain, A. K., Strength of Materials and Theory of Structures, Laxmi Publications, 1992
2. Wang C, Chu-Kia. Intermediate structural analysis. McGraw-Hill Publishers, 2017
3. Hibbeler, R. C., Structural Analysis, Pearson, 2017.

Reference Books:

1. Jain A, Reddy S., Basic Structural Analysis, Tata McGraw-Hill Education, New Delhi, 1994.
2. Norris, C. H., Wilbur, J. B., Utku, S., Elementary structural analysis. McGraw-Hill Science, 1976
3. Neal, B. G., The plastic methods of structural analysis, Chapman and Hall, 1966.

Semester - VI						
Sl No	Course Code	Course Title	L	T	P	C
1	CE-321A/ CE-321B	ELECTIVE 03-DSE03 - Surveying - II ELECTIVE 04-DSE04 – Environmental Engineering-II	3	0	0	3
2	CE-322A/ CE-322B	ELECTIVE 05-DSE05 - Design of Advanced Steel structural Elements ELECTIVE 06-DSE06- Prestressed Concrete Structure	3	0	0	3
3	CE-323A/ CE-323B	ELECTIVE 07-DSE07 – Structural System Analysis ELECTIVE 08-DSE08 - Construction Management	3	0	0	3
4	CE-324A / CE-324B	ELECTIVE-09-DSE09 - Sustainable Construction and Green Manufacturing ELECTIVE-10-DSE10- Engineering Hydrology	3	0	0	3
5	CE-320X	OE-02 - Environmental Science and Engineering	3	0	0	3
7	CE-3206	AP2-03- VAC5 - Minor Project	0	0	4	2
8	CE-3207	MAJOR-29 - LAB10 - Computer Applications in Civil Engineering	0	0	2	1
9	CE-3208	MAJOR-30- LAB11 Civil Engineering Drawing Lab- I	0	0	2	1
10	CE-325A CE-325B	ELECTIVE-11 - LAB12- Surveying Laboratory – II ELECTIVE-12 – LAB13 – Advanced Environmental Engineering Laboratory	0	0	2	1
11	CE-3210	AP2-04 SECC8 Skill Development - 04	0	0	2	1
12	CE-321H	Structural Dynamics	3	0	0	3*
Contact Hours			15	0	12	
*Credit for B. Tech (Hons)						
Total Credits						21



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CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				VI		
Course Code		Course Name							Credit Structure				Marks Distribution				
									L	T	P	C	INT	MID	END	Total	
CE-321A		ELECTIVE 03-DSE03 - Surveying - II							3	0	0	3	20	30	50	100	
Course Objectives		1. To experience the different surveying methods such as trigonometric levelling and tacheometry.							Course Outcomes	CO1	Understand the basic of trigonometric levelling and tacheometry.						
		2. To study different types of curves and triangulation methods.								CO2	Have the knowledge on various types of curves and types of triangulation survey.						
		3. To understand the basic of GPS, GIS, remote sensing, and total station.								CO3	Attain knowledge GPS, GIS, remote sensing, and total station						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	2	2	0	0	0	0	0	0	1	0	0	0	3	0	0	
2	CO2	3	3	0	0	0	0	0	0	1	0	0	0	2	0	0	
3	CO3	3	3	0	0	0	0	0	0	1	0	0	0	3	0	0	
SYLLABUS																	
No.	Content													Hours		COs	
I	Levelling: Trigonometric levelling, Base of the object accessible, base of an inclined object accessible, R.L of an elevated points with inaccessible bases, Cross-sectioning, profile levelling, precise levelling, reciprocal levelling													45		CO1	
II	Tachometry: Instrument used, Methods of Tacheometry, fixed hair method, movable hair method, range finding.															CO1	
III	Curves: Types of curves, elements of curve, different methods of setting out-simple circular curves, compound curves, reverse curves, transition curves, types of transition curves, super- elevation, suitability of a circular curve, vertical curves. Triangulation: Principles of triangulation, Classifications, purpose, layout, Field work, Types of triangulation station.															CO2	
IV	Total Station and GPS: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory, electromagnetic distance measuring system - principle of working and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.															CO3	

V	Introduction to GIS: Introduction – GIS definition, development, application areas. GIS Applications – Transportation, Water Resources, Environment, Geology, Emergency Management, Agriculture, Urban planning, climate change, Business Introduction to Remote Sensing Techniques: Advantages of Remote Sensing over conventional surveying methods. Applications: Geosciences, Water Resources, Land use – Land cover, Transportation Engineering, Image Interpretation.		CO3
Total Hours		45	
Text Books:			
1. Gopi S, Sathikumar R, Madhu N., Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education India, 2017. 2. Duggal S.K., Surveying Volume-II, Tata McGraw Hill Publisher, New Delhi, 2017. 3. Arora. K.R., Surveying Volume-II, Standard Publishers Distributors, 2019.			
Reference Books:			
1. Agor R., A Textbook of Surveying and Levelling, Khanna Publishers, New Delhi, 2015. 2. James B. C, Randolph H. W., Introduction to Remote Sensing, The Guilford Press, 2011.			

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Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation			2025-29		
Department		Civil Engineering									Semester			VI		
Course Code		Course Name						Credit Structure				Marks Distribution				
								L	T	P	C	INT	MID	END	Total	
CE- 322A		ELECTIVE 05-DSE05 Design of Advanced Steel Structural Elements						3	0	0	3	20	30	50	100	
Course Objectives		1. To study the behavior and design of member subjected to combined forces.						Course Outcomes	CO1	1. At the end of the course, student will be able to: Design eccentrically loaded compression members (Beam-Columns) and their base plates.						
		2. To understand the analysis procedure and design of base plate subjected to different loading conditions.							CO2	2. At the end of the course, student will be able to: analyze and design the base plate.						
		3. To study the design of Gantry girder, welded plate girder, stiffeners and connections.							CO3	3. At the end of the course, Student will be able to: Design welded plate girder and other components as well as gantry girder for industrial structure.						
		4. To calculate the wind forces on various types of structures.							CO4	4. At the end of the course, student will be able to: Calculate the wind load acting on various structure to be built in various locations.						
		5. To understand the design of industrial buildings/bents/							CO5	5. At the end of the course, student will be able to: Design industrials structure and their component such as girts, wind girders, bracings systems purlins etc.						
No.	COs	Mapping with Program Outcomes (POs)											Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	
1	CO1	3	3	3	2	1	-	-	-	-	-	-	2	1	-	
2	CO2	3	3	3	2	1	-	-	-	-	-	-	2	1	-	
3	CO3	3	3	3	2	1	-	-	-	-	-	-	2	1	-	
4	CO4	3	3	3	2	1	-	-	-	-	-	-	2	1	-	
5	CO5	3	3	3	2	1	-	-	-	-	-	-	2	1	-	
SYLLABUS																
No.	Content												Hours	COs		
	Introduction to beam-column - behavior - strength interaction design of beam column - beam - column subjected to combined forces - column bases - slab base - gusseted base moment resistant base plate.												45	CO1 & CO2		
	Welded plate girders analysis and design using IS800-2007 - curtailment of flange plates-stiffeners - Introduction to hybrid girders - analysis and design of gantry girder.													CO3		
	Design of industrial building roofing, cladding and wall material structural components and framing types of roof trusses components - wind load estimation for different type of structures for various zones.													CO4		
	Approximate analysis of industrial bents/PEB design of purlins and wall girts using Channel and Angle sections; cold formed steel purlin - Design of wind bracings-wind girders gable columns													CO5		
Total Hours												45				
Text Books:																
1. Duggal, S. K., Limit state design of steel structures, Tata McGraw Hill Publishers, 2019.																
2. Subramanian, N., Steel structures-Design and practice, Oxford University Press., 2018.																
3. Negi, L. S., Design of Steel Structures, Tata Mc Graw Hill Publishers, 2017.																
Reference Books:																
1. Bhavikatti, S. S., Design of Steel Structures (By Limit State Method as Per Is: 800 2007). IK International Pvt Ltd., 2019																
2. SP6 (1)-1964, IS hand book for structural Engineers. Bureau of Indian Standards, New Delhi.																
3. IS 800 - 2007, Code of practice for general construction in steel, Bureau of Indian Standards, New Delhi. 5)																

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Programme		Bachelor of Technology in Civil Engineering										Academic Year of Regulation				2025-29		
Department		Civil Engineering										Semester				VI		
Course Code		Course Name								Credit Structure				Marks Distribution				
										L	T	P	C	INT	MID	END	Total	
CE- 320X		OE-02 - Environmental Science and Engineering								3	0	0	3	20	30	50	100	
Course Objectives		To develop understanding of atmospheric science including quantifying climate sensitivity to changes in greenhouse gases and interrelation between the various components of the climate system. 2. To define and classify natural water sources, water demand, population forecasting 3. To study the various water treatment methods for drinking and waste water 4. To understand and study the urban - rural sanitation system								Course Outcomes	CO1	1. Will understand source and cycle of water in our environment,						
											CO2	2. Comprehensive overview of the water supply system and its design its flow and efficiency						
											CO3	3. Understand the fundamental principles of existing and emerging technologies for the treatment of water						
											CO4	4. Deal with the various rural and urban sanitation systems						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3		
1	CO1	3	1	0	0	0	1	3	0	1	1	0	2	3	3	3		
2	CO2	3	1	0	1	2	1	2	0	1	2	0	2	3	3	3		
3	CO3	3	1	2	1	2	1	2	0	1	2	0	2	3	3	3		
4	CO4	3	1	0	0	0	2	3	0	1	2	0	2	3	3	3		
SYLLABUS																		
No.	Content													Hours		COs		
I	Introduction: Environment and ecology, source of water, water demand and supply, population forecasting, design period. Physical chemical and biological characteristics of water and waste water, chemical significance of pollutant parameters and effluent discharge standards.													5		CO1, CO2, CO3		
II	Primary treatment: screening, neutralization, equalization, flocculation, sedimentation, floatation, stripping. Tertiary treatment: Oxidation/reduction, precipitation, adsorption, ion exchange and membrane processes, disinfection													8		CO2		
III	Policies for solid waste: MSW, C&D, Plastic waste, Bio-medical waste, E-waste, Collection and handling of above-mentioned waste types may also be included in the syllabus,													8		CO3		
IV	Water distribution systems: different pipe systems, design considerations, laying, testing and effects of pipe corrosion and its preventive measures. Sewers: hydraulic design, construction and appurtenances, operation and maintenance. Pumps and pumping: necessity, types of pumps, characteristics curves, selection criteria, economical diameter of pumping/transmission main, problems in sewage pumping													10		CO3		
VI	Rural and Semi urban sanitation: Collection and disposal of dry refuse, sullage, excretal waste, night soil disposal without water carriage, latrines, chemical toilets, precast units for low cost sanitation. Management of municipal solid waste (MSW), source, method of collection, disposal, landfill types.													5		CO2, CO4		
V	Air pollution: Fundamentals of air pollutants and impact, ambient air monitoring, emission factors; overview of prediction models, air pollution control techniques, suppression and consolidation of dust.													5		CO3		
VI	Noise Pollution: Fundamentals of Noise Pollution and Impact, monitoring and control measures													4		CO3		
Total Hours													45					
Text Books:																		
1. Punmia B.C., Environmental Engg. (Vol. I), Laxmi Publications, 2005.																		
2. Garg S.K., Water Supply Engg. (Vol. I), Khanna Publications, 2003.																		
Reference Books:																		
1. Peavy & Rowe, Environmental Engineering, McGraw Hill Publications, 2017.																		
2. Birdie G.S., Water Supply, Dhanpath Roy publication, 2017.																		
3. Davis M. L., Cornwell A. A., Introduction to environmental engineering, Mc Graw Hill publishers, 2014.																		



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CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				VI		
Course Code		Course Name							Credit Structure				Marks Distribution				
									L	T	P	C	REORT	VIVA	EXAM	Total	
CE- 325A		ELECTIVE-11 – LAB12- Surveying Laboratory - II							0	0	2	1	30	20	50	100	
Course Objectives		1. To understand the trigonometric and tacheometric surveying.							Course Outcomes	CO1	Use and operate theodolite in the field.						
		2. To set out curves in the field								CO2	Apply the knowledge of theodolite in different operations in Civil Engineering projects.						
		3. To understand the total station and GPS.								CO3	Apply the knowledge of principles and purpose of tacheometry in finding out the constants.						
										CO4	Formulate the setting out of curve by linear and angular methods and use of Total Station and GPS in the field of Civil Engineering.						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	2	2	0	0	1	1	1	0	1	0	0	0	2	0	0	
2	CO2	3	3	0	0	0	0	1	0	1	0	0	0	2	0	0	
3	CO3	3	3	0	0	0	0	1	0	1	0	0	0	3	0	0	
4	CO4	3	3	0	0	1	0	1	0	1	0	0	0	3	0	0	
SYLLABUS																	
No.	Content													Hours		COs	
I	To study the parts and working of a theodolite.															CO1	
II	Measure the horizontal angles between the given stations about the instrument station as the vertex by the method of repetition.															CO1	
III	Measure the horizontal angles between the given stations about the instrument station as the vertex by the method of reiteration.															CO2	
IV	Determine the vertical angle and the height of the pole/building at the same level as that of instrument with the help of theodolite.															CO2	
V	Determine the height and distance of the pole/building, when the base is inaccessible.															CO2	

VI	Determine the constants of a tacheometer using fixed hair method.		C03
VII	Measurement of horizontal distance using tacheometer.		C03
VIII	Setting out of curve using long chord method		C04
IX	Traversing and area calculation using Total Station and introduction to GPS.		C04
Total Hours		30	
Text Books:			
1. Punmia, B.C, Jain A. K, Jain A.K., Surveying Volume-I & II, Laxmi Publications, 2016.			
2. Chandra A. M., Higher Surveying, New Age International Publishers, 2007.			
Reference Books:			
1. Survey lab Manual			



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NATIONAL INSTITUTE OF TECHNOLOGY ARUNACHAL PRADESH
 (शिक्षा मंत्रालय, भारत सरकार के तहत राष्ट्रीय महत्व का संस्थान)
 (Institute of National Importance under Ministry of Education, Govt. of India)

CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				VII		
Course Code		Course Name							Credit Structure				Marks Distribution				
									L	T	P	C	REORT	VIVA	EXAM	Total	
CE-325B		ELECTIVE-12-LAB-13 Advanced Environmental Engineering Laboratory							0	0	2	1	0	0	100	100	
Course Objectives		1. To advanced analytical and technical skills in environmental monitoring, data interpretation							Course Outcomes	CO1	1. Analyze the various concentration of phyco-chemical & biological parameters of water and soil						
		2. To problem-solving to address complex issues such as pollution and sustainability.								CO2	2. Suggest appropriate technology for treating the water and waste water						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	3	1	0	0	0	1	2	1	0	0	1	2	2	3	2	
2	CO2	3	0	1	1	1	0	2	0	1	0	1	2	2	3	2	
SYLLABUS																	
No.	Content													Hours		COs	
I	To determine the volatile matter , ash content and total organic content of solid waste															CO1, CO2	
II	To Determination of Total Nitrogen in Soil Sample by Kjeldahl Method.															CO1, CO2	
III	To determine the heavy metal in water and soil by MPAES															CO1, CO2	
IV	To determine the phosphorus in water															CO1, CO2	
V	Bacteriology of drinking water and domestic sewage -MPN techniques for total coliform, Faecal coliform and Faecal Streptococci (FS), Membrane filtration techniques for faecal coliform and total coliform															CO1, CO2	
VI	To determination of Specific Gravity, Bulk Density and Moisture Content of a given soil sample															CO1, ,CO2	
VII	To Moisture or Water Content of Soil															CO1, CO2	

VIII	To determine the Cation Exchange Capacity (CEC) of the supplied soil		CO1,CO2
IX	To study the different types of culture media for the growth of microorganisms.		CO1,CO2
Total Hours		30	
Text Books:			
1. Environmental Engineering Laboratory Manual by <u>Barani Tharan Balamurali S</u> 2. Handbook of Environmental Engineering By <u>Tian Zhang</u> , <u>Mausam Verma</u> , <u>Rao Surampalli</u> , <u>Rama Pulicharla</u> , <u>Krishnamoorthy Hegde</u>			
Reference Books:			
1. Wastewater Engineering- Treatment and Reuse, Metcalf & Eddy (Revised by G. Tchobanoglous, F. L. Burton and H. D. Stensel), Tata McGraw Hill.			
2. Chemistry for Environmental Engineers, Sawyer C. N., McCarty P. L and Parkin G. F., McGraw- Hill.			
3. APHA, Standard Methods Examination of Water and Wastewater, American Public Health Association, Washington DC, 1995.			
4. Manual for water supply and treatment, Central Public Health & Environmental Engineering Organization, Ministry of Housing and Urban Development, Govt. of India, 1999.			



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CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-26		
Department		Civil Engineering									Semester				VI		
Course Code		Course Name							Credit Structure				Marks Distribution				
									L	T	P	C	REPORT	VIVA	EXAM	Total	
CE-3210		AP2-04-SECC8-Skill Development-04 “DGPS-Based Surveying and Terrain Modelling using GIS Tools”							0	0	2	1	30	20	50	100	
Course Objectives		1. To train students in DGPS surveying techniques for precision data collection.							Course Outcomes	CO1	Conduct DGPS field surveys and process raw data.						
		2. To develop skills in terrain modelling, contouring, and GIS-based visualization.								CO2	Generate terrain and contour models using GIS tools.						
										CO3	Integrate DGPS data into CAD or BIM environments for design use.						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	2	2			2							1	3			
2	CO2	3	3	1	3	3	1		1	1			1	3			
3	CO3	2	2	1	2	2	2		1	1			1	3	2	2	
SYLLABUS																	
No.	Content													Hours		COs	
I	Basics of DGPS and coordinate systems (WGS84, UTM). DGPS field survey: base–rover setup and data logging. Post-processing of DGPS data (Trimble Business Center / QGIS). Terrain modelling: contours, DEM, and volume estimation in GIS. Mini Project: DGPS-based topographic or alignment survey.													30		CO1, CO2, CO3	
Total Hours													30				
Reference Books:																	
1. B. Bhatta, Remote Sensing and GIS, Oxford University Press, 2011. 2. Kang-Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill, 2019. 3. Alfred Leick et al., GPS Satellite Surveying, Wiley, 2015.																	

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Programme		Bachelor of Technology in Civil Engineering										Academic Year of Regulation			2025-29		
Department		Civil Engineering										Semester			VI		
Course Code		Course Name					Credit Structure				Marks Distribution						
							L	T	P	C	INT	MID	END	Total			
CE- 321H		ELEMENTARY STRUCTURAL DYNAMICS					3	0	0	3	20	30	50	100			
Course Objectives		1. To introduce the concepts of dynamic systems.					Course Outcomes	CO1	1. At the end of the course, student will be able to: Apply the concepts of dynamic systems.								
		2. To study the dynamic response of SDOF						CO2	2. At the end of the course, student will be able to: Identify, formulate and solve dynamic response of SDOF.								
		3. To study the dynamic response of MDOF						CO3	3. At the end of the course, Student will be able to identify, formulate and solve dynamic respond of MDOF								
		4. To introduce the continuous system subjected to different types of dynamic loads.						CO4	4. At the end of the course, student will be able to: Analyse continuous systems subjected to different types of dynamic loads								
		5. To introduce the continuous system subjected to different types of dynamic loads.						CO5	5. At the end of the course, student will be able to: Identify, formulate and solve free and forced vibrations response of structural systems								
No.	COs	Mapping with Program Outcomes (POs)											Mapping with PSOs				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3		
1	CO1	3	3	3	3	2	1	1	1	2	1	3	3	2	1		
2	CO2	3	3	3	3	3	1	1	1	2	1	3	3	3	1		
3	CO3	3	3	3	3	3	1	1	1	2	1	3	3	3	1		
4	CO4	3	3	3	3	3	1	1	1	2	1	3	3	3	1		
5	CO5		3	3	3	2	1	1	1	2	1	3	3	2	1		
SYLLABUS																	
No.	Content												Hours	COs			
	Dynamic analysis - Elements of vibratory systems and Simple Harmonic Motion.												45	CO1			
	Free vibration of Single Degree of Freedom Systems; undamped and damped systems. Viscous damping and Coulomb damping. Evaluation of damping Forced vibration of undamped and damped systems -Structures subjected to harmonic loads.													CO2			
	Resonance condition. Dynamic Amplification Factors. General types of loads Duhamel's integral approach to solution. Free vibration analysis using Rayleigh's method Differential equation of motion-Thin Beam flexural vibration analysis - Beam functions.													CO3			
	Free vibration of Multi - Degree of freedom systems Solution of the eigen value problem - Iteration due to Holzer and Stodola. Idealization of multi - storeyed - lumped SDOF system.													CO4, CO5			
Total Hours												45					
Text Books:																	
1. Mario Paz, Structural Dynamics, CBS, Publishers, 1987.																	
2. Roy R Craig, Jr., Structural Dynamics, John Wiley & Sons, 1981.																	
3. A.K. Chpora “Dynamics of Structures Theory and Application to Earthquake Engineering” Pearson Education, 2001.																	
Reference Books:																	
1. Leonard Meirovitch, Elements of Vibration Analysis, McGraw Hill,2014.																	
2. Madhujit Mukhopadhyay,” Structural Dynamics: Vibrations and Systems”, Ane’s Student Edition,2017.																	

Semester – VII						
Sl No	Course Code	Course Title	L	T	P	C
1	CE-411A/ CE-411B	ELECTIVE-13-DSE011 - Civil Engineering Construction and Development ELECTIVE-14-DSE12- Maintenance and Rehabilitation of Structures	3	0	0	3
2	CE-412A / CE-412B/	ELECTIVE-15-DSE13- Prefabricated structures / ELECTIVE-16-DSE14- Environmental Systems Design and Modelling	3	0	0	3
	CE-413A / CE-413B/	ELECTIVE-17-DSE15 - Remote Sensing and GIS ELECTIVE-18-DSE16 - Disaster Management	3	0	0	3
3	CE-414A / CE-414B /	ELECTIVE-20- DSE18 -Traffic Engineering ELECTIVE-21- DSE19- Railway, Airport and Tunnel	3	0	0	3
4	CE-415A/ CE-415B/ CE-415C	ELECTIVE-23- DSE21- Irrigation and Hydraulic Structures ELECTIVE-24- DSE22 - Ground Water Engineering ELECTIVE-25- DSE23 - River Engineering	3	0	0	3
5	CE-416A/ CE-416B	ELECTIVE-26- DSE24 - Estimation, Contract and Valuation ELECTIVE-27- DSE25- Optimization in Civil Engineering (SWAYAM/NPTEL)	3	0	0	3
6	CE-4106	AP2-05 - AECC2 - Internship-II	0	0	2	1
7	CE-4107	AP2-06- VAC6 - Major Project-I	0	0	6	3
8	CE-410H	Advanced Foundation Engineering	3	0	0	3*
Contact Hours			15	0	10	
*Credit for B. Tech (Hons)						
Total Credits						22

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Programme		Bachelor of Technology in Civil Engineering										Academic Year of Regulation				2025-29																	
Department		Civil Engineering										Semester				VII																	
Course Code		Course Name								Credit Structure				Marks Distribution																			
										L		T		P		C		INT		MID		END		Total									
CE-411A		ELECTIVE-13-DSE011 - Civil Engineering Construction and Management								3		0		0		3		20		30		50		100									
Course Objectives		1. To know the managerial duties and responsibilities.								Course Outcomes		CO1		To introduce a concepts of projects formulation.																			
		2. To learn about man power planning and estimation of equipment cost.										CO2		To impart the idea about planning and scheduling of activities.																			
		3. To understand project planning and scheduling concepts..										CO3		To introduce the concepts of resource planning and allocation and control.																			
		4. To know the types of construction contracts and their drafting.										CO4		To provide a bird’s eye view of optimization techniques.																			
		5. To learn the application of computer software in construction management																															
No.		COs		Mapping with Program Outcomes (POs)												Mapping with PSOs																	
				PO1		PO2		PO3		PO4		PO5		PO6		PO7		PO8		PO9		PO10		PO11		PO12		PSO1		PSO2		PSO3	
1		CO1		3		3		1		1		1		1		1		1		2		2		3		3		2		3		3	
2		CO2		3		3		3		3		2		1		1		1		2		2		3		3		2		3		3	
3		CO3		3		3		3		3		2		1		1		1		2		2		3		3		2		3		3	
4		CO4		3		3		3		3		1		1		1		1		2		2		3		3		2		3		3	
SYLLABUS																																	
No.		Content												Hours				COs															
I		Introduction – Project Planning, Scheduling, Controlling, Role of decision in project management, Techniques for analysing alternative: Operation research. Construction Project Formulation - Principles of Management – different types of construction projects –Project Life Cycle- phases in project life cycle- Pre-feasibility report and clearance- project estimate- Techno Economic feasibility report- detailed project report.												8				CO1															
II		Construction Planning and Scheduling – Work breakdown structure- plan development process- scheduling-definition – types of construction schedules-scheduling techniques-CPM – Terms and definitions –Earliest and Latest times – different types of floats – significance- calculation of critical path method-PERT – terms and definitions network and solving problems using PERT – standard deviation and probability calculation in PERT.												15				CO2															
III		Resource Planning Allocation and Control – Materials - Quantity of materials – time of purchase- inventory control – terms and definitions – types of inventories –EOQ –reasons for maintain inventory – different tools for inventory. Equipment - Classification of major construction equipment- planning and selecting of equipment- task consideration – cost consideration.												8				CO2															
IV		Labour - Classes of labour – cost of labour- labour schedule – optimum use of labour. Introduction- resource allocation- resource leveling-resource loading graph – cost control – earned value concepts- “S” curve technique in cost control – Risk cost management- stages in risk management- controlling the risk.												8				CO3															
V		Introduction to Estimation and costing - Importance, Items of a work and their units. Types of estimates, viz. preliminary; approximate; Abstract estimate; Plinth area estimate; detailed estimate; revised estimate; supplementary estimate, Bill of quantities and abstract of cost.												6				CO4															
Total Hours												45																					
Text Books:																																	
1. Jha, Kumar Neeraj., Construction project management: Theory and practice, Pearson Publication, 2015, Second edition.																																	
2. Choudhary S, Project Management, Tata McGraw Hill Publishing Company Limited, New Delhi.																																	
3. Dutta. B.N., Estimating and Costing in Civil Engineering: Theory and Practice including specifications and valuation, UBS Publishers and distributors, 27th revised edition.																																	
Reference Books:																																	
1. Chitkara, K. K. Construction project management. Tata McGraw-Hill Education Tata McGraw Hill Publishing Company Limited, New Delhi, 2019, Fourth Edition.																																	
2. Puerifoy R.L, Construction Planning Equipment & methods, Tata McGraw-Hill Education Tata McGraw Hill Publishing Company Limited, 2010.																																	

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Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation			2025-29		
Department		Civil Engineering									Semester			VII		
Course Code		Course Name						Credit Structure				Marks Distribution				
								L	T	P	C	INT	MID	END	Total	
CE- 411B		ELECTIVE14 - DSE12 Maintenance and Rehabilitation of Structures						3	0	0	3	20	30	50	100	
Course Objectives		To provide a comprehensive knowledge on the diagnosis the damage, condition assessment of structures and quality of material application relating to maintenance and rehabilitation of structures						Course Outcomes	CO1	1. At the end of the course, student will be able to: Diagnosis the damage of distress structures						
									CO2	2. At the end of the course, student will be able to: investigate the condition assessment of structures						
									CO3	3. At the end of the course, Student will be able to: Select the proper repair materials and its application						
									CO4	4. At the end of the course, student will be able to: Select the method to Strengthen the distressed structures						
No.	COs	Mapping with Program Outcomes (POs)											Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	
1	CO1	3	1	2	2	-	1	1	-	-	-	-	2	-	1	
2	CO2	3	1	2	2	-	1	1	-	-	-	-	2	-	1	
3	CO3	3	1	2	2	-	1	1	-	-	-	-	2	-	1	
4	CO4	3	1	2	2	-	1	1	-	-	-	-	2	-	1	
SYLLABUS																
No.	Content												Hours	COs		
1.	Performance of construction materials and components in services for strength, permeability, thermal properties and cracking effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, Effects of cover thickness.												45	CO1		
2.	<i>Maintenance and Diagnosis</i> Maintenance, Repair and rehabilitation, Facets of Maintenance, Importance of Maintenance, Preventive measures based on various aspects of inspection- Condition assessment and rating procedure for evaluating a damaged structure. Diagnosis of construction failures. Different types of concrete deterioration. <i>Corrosion damages and protection</i> Corrosion damage of reinforced concrete, methods of corrosion protection, Corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection, rust eliminators. Causes of deterioration of concrete, steel, masonry and timber structures, surface deterioration, efflorescence, causes, prevention and protection.													CO2		
3.	<i>Materials and Techniques</i> Surface repair strategies and materials Special concrete and mortar, concrete chemicals, expansive cement, polymer concrete sulphur infiltrated concrete, Ferro cement, fiber reinforced concrete, Surface preparation and protective treatments. -surface coatings, Waterproofing materials Methods of repair in concrete, steel and masonry structures. Guniting and shotcrete, epoxy injection.													CO3		
4.	<i>Strengthening and demolition</i> Strengthening of existing structures repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering, wear, fire, leakage, marine exposure, coatings for set concrete and steel reinforcement. Demolition techniques of structures-case studies.													CO4		
Total Hours												45				
Text Books:																
1. Varghese P.C., Maintenance Repair and Rehabilitation & Minor Works of Buildings, PHI Learning Pvt. Ltd., 2014.																
2. Allen. R.T, and Edwards .S.C, Shaw D.N, ”Repair of Concrete Structures”,Chapman and Hall, 2005																
3. Woodson R. D., Concrete Structures – Protection, Repair and Rehabilitation, Butterworth-Heinemann, Elsevier, 2009																
Reference Books:																
1. Raiker .R.N, ”Learning from Failures, Deficiencies in Design, Construction and Service”, - R&D Centre (SDCPL), Raikar Bhavan, Bombay 1987.																
2. Emmons P.H., Concrete Repair and Maintenance Illustrated, RS Means Inc., 1993.																
3. Dov Kominetzky.M.S., - Design and Construction Failures, Galgotia Publications Pvt.Ltd., 2001																
4. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008.																
5. Hand Book on “Repair and Rehabilitation of RCC Buildings” – Director General works CPWD ,Govt of India , New Delhi – 2002																

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Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				VII		
Course Code		Course Name						Credit Structure				Marks Distribution					
								L	T	P	C	INT	MID	END	Total		
CE- 412A		ELECTIVE 15-DSE13 - Prefabricated Structures						3	0	0	3	20	30	50	100		
Course Objectives		1. Understand the concepts and behaviour of prefabrication and types and its systems						Course Outcomes	CO1	1. At the end of the course, student will be able to: Know the behaviour of prefabricated structures.							
		2. Perform analysis and design of cross section and the joints in structures.							CO2	2. At the end of the course, student will be able to: Become familiar with the production of prefabrication units and erection process.							
		3. Analyze and design of prefabricated concrete members analysis							CO3	3. At the end of the course, Student will be able to: Able to perform an industry relevant design project in a team setting.							
		4. Obtain knowledge in design of cross section and the joints.							CO4	4. At the end of the course, student will be able to: Exhibit their knowledge in designing and detailing of prefabrication units.							
No.	COs	Mapping with Program Outcomes (POs)											Mapping with PSOs				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3		
1	CO1	3	3	3	1	3	1	-	-	1	2	1	2	2	1		
2	CO2	3	3	3	2	3	1	-	-	1	3	2	2	2	2		
3	CO3	3	3	3	1	3	1	-	-	1	2	1	2	2	1		
4	CO4	3	3	3	2	3	1	-	-	1	3	2	2	2	2		
SYLLABUS																	
No.	Content												Hours		COs		
1.	Need for prefabrication - Types of prefabrication- Principles - Materials - Modular co-ordination - Standardization - Systems Production - Transportation - Disuniting of structures												45		CO1		
2.	Behaviour of structural components – Large panel constructions – Construction of roof, floor slabs and Wall panels – Columns – Shear walls.														CO2		
3.	Design of Structural components – Beam, Column and Corbel - Stress limitations – Handling without cracking, handling with controlled cracking – Design for stripping forces														CO3		
4.	Joints for different structural connections – Beam to Column, Beam to Beam, Column to Column, Column to Foundation, Connections between wall panels, Connections between floor panels - Dimensions and detailing – Design of expansion joints-Jointing Material														CO4		
Total Hours												45					
Text Books:																	
1. Koncz T., Manual of Precast Concrete Construction, Vols. I, II and III, Bauverlag, GMBH, 1971																	
2. Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in the Use of Precast Concrete, Netherland Betor Verlag, 1978																	
3. Haas. A.M., Precast Concrete Design and Applications,CRC Press,1983																	
4. PCI Manual for Structural Design of Architectural Precast Concrete, PCI Publication number MNL-121-77,1977.																	
5. M.Levitt, “Precast Concrete Material, Manufacture, Properties and Usage” Applied Science Publishers Ltd., 1982.																	
Reference Books:																	
1. Building Materials and Components, CBRI, India, 1990																	
2. Glover C.W, Structural Precast Concrete, Asia Publishing House, 1965																	
3. PCI Design Hand Book, 6th Edition, 2004.																	
4. Structural Design manual, Precast concrete connection details, Society for studies in the use of Precast concrete, Netherland BetorVerlag, 2009																	
5. Laszlo Mokka, Prefabricated Concrete for Industrial and Public Structures, AkademiaiKiado, Budapest, 2007																	
6. Lewicki.B, Building with Large Prefabricates, Elsevier Publishing Company, 1988																	



CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29			
Department		Civil Engineering									Semester				III			
Course Code		Course Name							Credit Structure				Marks Distribution					
									L	T	P	C	INT	MID	END	Total		
CE- 210B		ELECTIVE-17-DSE-15-Remote sensing and GIS							3	0	0	3	20	30	50	100		
Course Objectives		1. To have idea about the basics of remote sensing.							Course Outcomes	CO1	Identify the earth surface features.							
		2. To know GIS applications in transportation, water resources, and environment.								CO2	Analyse the energy interaction with atmosphere and earth surface features.							
		3. To have idea about the soil, air water relationship								CO3	Select the type of remote sensing technique / data for required application.							
		4. To have idea of the different properties of soil								CO4	Apply the remote sensing principles in civil engineering practice							
		5. To inculcate research directions in the field of Geotechnical Engineering								CO5	Application of Image processing							
										CO6	Know about GIS application							
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3		
1	CO1	3	1	0	3	2	1	2	1	1	2	1	2	3	3	3		
2	CO2	3	3	0	2	2	1	2	1	1	2	1	2	3	3	3		
3	CO3	3	1	0	3	2	1	2	1	1	2	1	2	3	3	3		
4	CO4	3	3	0	3	2	2	3	2	1	2	1	2	3	3	3		
5	CO5	1	-	0	2	2	1	2	1	1	2	1	2	3	3	3		
6	CO6	3	3	0	2	2	1	2	1	1	2	1	2	3	3	3		
SYLLABUS																		
No.	Content													Hours		COs		
I	Physics of Remote Sensing: Sources of Energy, Active and Passive Radiation, Stages of remote Sensing, Advantages of Remote Sensing over conventional surveying methods.													8		CO1		
II	Electromagnetic Spectrum: Wavelength regions important to remote sensing, Reflectance, Transmission, Absorption, Thermal Emissions, Interaction with Atmosphere, Atmospheric windows, Spectral reflectance of Earth's surface features, Multi concept of Remote Sensing.													3		CO2		
III	Platforms and Sensors: Types of platforms, orbit types, Sun-synchronous and Geosynchronous, Passive and Active sensors, resolution concept.													7		CO3		
IV	Physics of Remote Sensing: Sources of Energy, Active and Passive Radiation, Advantages of Remote Sensing over conventional surveying methods													5		CO4		
V	Image Processing - Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised. Applications: Geosciences, Water Resources, Land use – Land cover, Transportation Engineering, Image Interpretation													7		CO5		
VI	Introduction to GIS: Introduction – GIS definition, development, application areas. GIS Applications-Transportation, Water Resources, Environment, Geology, Emergency Management, Agriculture, Urban planning, climate change, Business.													10		CO6		
Total Hours													45					
Text Books:																		
1. Remote sensing and image Interpretation, Lillisand T.M and Kiefer R.W., John Wiley & Sons, 2015																		
2. Introduction to Remote Sensing, James B. Campbell, Randolph H. Wynne., The Guilford Press, 2011																		
3. Advanced Surveying: Total Station, GIS and Remote Sensing, Gopi., Pearson Education India, 2007.																		
Reference Books:																		
1. Remote Sensing: Principles and interpretation, Floyd F.Sabins, W.H. Freeman and Company, 2007																		
2. Bhatta, “Remote sensing and GIS”, Oxford Publishers, 2020																		

1. Roess R.P., Prassas S.E, Mc- Shane W.R., Traffic Engineering, Prentice Hall, 2011.

2. Khanna K S., Justo C E G., Veeragavan A., Highway Engineering, Nem Chand & Bros, 2020.

Reference Books:

1. O' Flaherty C. A., "Traffic Planning and Engineering", Elsevier India, 2006.

2. Fred L. Mannering, Scott S. Washburn, and Walter P. Kilareski, "Principles of Highway Engineering and Traffic Analysis", Wiley, 2011.

3. Pignataro, L., "Traffic Engineering - Theory and Practice", Prentice Hall, 1973.

4. Institute of Transportation Engineers, "Transportation and Traffic Engg. Hand Book", 6th edition, 2009. IRC-SP41, Guidelines for the Design of At-Grade Intersections in Rural and Urban Areas, 1994.

5. Leonard Evans, "Traffic Safety", Science Serving Society, 2004.

6. Michael, A. P. Taylor, William Young, and Peter W. Bonsall, "Understanding Traffic Systems", Ashgate Publishing, 2000.

7. Mike Slinn, Paul Matthews, Peter Guest, "Traffic Engineering Design - Principles and Practice", Butterworth- Heinemann, 2005.

8. Khisty, C J., Transportation Engineering – An Introduction, Prentice-Hall, NJ, 2007



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 (शिक्षा मंत्रालय, भारत सरकार के तहत राष्ट्रीय महत्व का संस्थान)
 (Institute of National Importance under Ministry of Education, Govt. of India)

CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				VII		
Course Code		Course Name							Credit Structure				Marks Distribution				
									L	T	P	C	INT	MID	END	Total	
CE- 414B		ELECTIVE-21- DSE19- Railway, Airport and Tunnel							3	0	0	3	20	30	50	100	
Course Objectives		1. To explain the importance of the various components of a railway track and materials.							Course Outcomes	CO1	Identify and explain the role of different components in a railway track.						
		2. To impart knowledge on the design of various geometric elements of a railway track.								CO2	Design the geometric elements of a railway track.						
		3. To highlight the factors in site selection for an airport, design of runway and taxiway								CO3	Describe various components of airport and tunnel.						
		4. To study the various elements of a tunnelling.								CO4	Design the geometric elements of an airport and tunnel.						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	1	0	2	0	0	2	1	0	0	0	0	1	3	0	0	
2	CO2	3	3	2	0	0	0	0	1	0	0	0	1	3	1	2	
3	CO3	3	3	2	0	0	2	1	1	0	0	0	0	3	1	2	
4	CO4	1	0	2	0	0	0	1	0	0	0	0	0	3	0	2	
SYLLABUS																	
No.	Content													Hours		COs	
I	Permanent Way and Components: History and administrative setup of Indian Railways; Rails, Type of rails, rail gauges, permanent way formation, – functions requirements, sections in embankment and cutting (single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. sleepers, timber, steel, cast iron, concrete and prestressed concrete sleepers, sleeper density, ballast: material, specifications.													45		CO1	
II	Track Geometrics, Turnouts and Crossings, Stations and Yards: Railway alignment, vertical alignment- gradients and grade effects, horizontal alignment-horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, points and crossings-terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning.															CO2	

III	Signalling and Interlocking: Classification of Signals, method of train working, absolute block system, Centralized train control system, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high speed technologies. Urban railway- railway system in urban areas.		CO2
IV	Introduction to Airport Engineering: Aircraft characteristics affecting airport planning & design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway design consideration and geometric design. Zoning laws, Visual aids and air traffic control, Runway lighting, Runway operation Helipads, hangers, service equipment.		CO3, CO4
V	Tunnel Engineering: Tunnel Alignment and Grade, Size and Shape of Tunnels, Tunnelling methods in Soft Soils and Hard Rocks – Modern methods and equipment for tunnelling; Ventilation of Tunnels; Lining of Tunnels.		CO3, CO4
Total Hours		45	
Text Books:			
1. Chandra S., Agarwal M., Railway Engineering, Charotar Publishing, 2015.			
2. Gupta B.L., Gupta A., Railway Engineering, Stanadard Publishers, 2005.			
3. Rangwala S C., Airport Engineering, Chorator publishing house, 2013.			
4. Norman J. A., Mumayiz S, Wright P H., Airport Engineering: Planning, Design and Development of 21st Century Airports, Wilwy and sons, 2016.			
5. Dr. S. Seetharaman, “Tunnel and Airport Engineering”, Umesh Publications, 2012.			
Reference Books:			
1. Papacostas S C., Prevedouros D P., Transportation Engineering, PHI publishers, 2016.			
2. Chakroborty P., Principles of Transportation Engineering, PHI publishers, 2020.			



CURRICULUM

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	2	2	3	1	2	1	1	1	2	1	1	2	3	2	2
2	CO2	2	2	3	2	2	1	1	1	2	1	1	2	3	2	3
3	CO3	2	2	3	1	1	1	1	1	2	1	1	1	2	3	2
4	CO4	3	3	3	2	2	1	1	1	2	1	2	2	3	3	3
5	CO5	3	3	3	2	2	1	1	1	2	2	2	2	3	3	3
6	CO6	2	2	2	2	2	1	1	1	2	1	2	1	2	2	2

SYLLABUS

Text Books:	
1.	Dutta. B.N, Estimating and Costing in Civil Engineering: Theory and Practice including specifications and valuation, UBS Publishers and distributors, 27th revised edition.
2.	Chakraborti. M, Estimating, Costing, Specification & Valuation in Civil Engineering, UBS Publishers and distributors, 2015.
3.	https://cpwd.gov.in/Documents/cpwd_publication.aspx

Reference Books:

1. Bhasin, P.L., Quantity Surveying, 2nd Edition, S. Chand & Co., 2000. Department of Civil Engineering, National Institute of Technology: Tiruchirappalli
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(Institute of National Importance under Ministry of Education, Govt. of India)

CURRICULUM

Programme	Bachelor of Technology in Civil Engineering	Academic Year of Regulation	2025-29
Department	Civil Engineering	Semester	VII

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total

CE-410H	Advanced Foundation Engineering	3	0	0	3	20	30	50	100
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Course Outcomes	1. To have knowledge of the sub surface investigation and bore log report interpretation.	Course Outcomes	CO1	Understanding of foundation elements.
	2. To study the evaluating the bearing capacity of the soil.		CO2	Planning of subsurface investigations.
	3. To study the load carrying capacity of the various types of foundation.		CO3	Understand the Settlement of foundation
	4. To study about well and machine foundation.		CO4	Understand the well foundation, machine foundation
	5. To have knowledge of the sub surface investigation and bore log report interpretation.		CO5	Understand the foundation on problematic soil

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	3	1	0	3	2	1	2	1	1	2	1	2	3	3	3
2	CO2	3	3	0	2	1	1	2	1	1	1	1	2	3	3	3
3	CO3	3	1	0	3	2	1	1	1	1	1	1	2	3	3	3
4	CO4	3	3	0	3	2	2	2	2	1	1	1	2	3	3	3
5	CO5	1	-	0	2	2	1	2	1	1	2	1	2	3	3	3

SYLLABUS

No.	Content	Hours	COs
I	Introduction , planning of soil exploration for different projects, methods of borings along with various penetration tests, geophysical soil exploration.	9	CO2
II	Shallow foundations , methods of estimating bearing capacity of combined footings and rafts, foundations under eccentric loading. Foundations under inclined loading, foundations on slope, foundations with tilted base. Bearing capacity of foundations on layered soil.	6	CO1
III	Pile foundations , pile load tests, methods of estimating load transfer of piles, analytical estimation of load-settlement behaviour of piles. Advanced analysis for pile group capacity and settlement, negative skin friction of piles. Laterally loaded piles. Uplift capacity of piles, foundations/anchors under uplift loads.	6	CO1
IV	Well foundation , bearing capacity of well foundations, lateral stability of well foundations. IS and IRC codal provisions, elastic theory and ultimate resistance methods for well foundations.	6	CO4
V	Machine foundation - Reciprocating, Impact and Rotary machine foundation.	9	CO4
VI	Foundations on problematic soils: foundations for collapsible and expansive soil.	9	CO5

Total Hours

ours

Text Books:

1. Ranjan G., Rao A S R., Basic and applied soil Mechanics, New age international Publishers, 2016
2. Punmia B.C., Jain K A., Soil Mechanics and foundations, Laxmi Publishers, 2017
3. Murthy V N S P., Geotechnical Engineering, UBS publishers, 2019

Reference Books:

1. Arora K.R., Soil Mechanics and Foundation Engineering, PHI publishers, 2016.
2. Das M. B., Fundamentals of Geotechnical Engineering, Cengage learning, 2010

Semester – VIII						
Sl No	Course Code	Course Title	L	T	P	C
1	CE-421A/	ELECTIVE-28- DSE26- Environmental Impact Assessment/SWAYAM*	3	0	0	3
	CE-421B/ CE-421OB	ELECTIVE-29 - DSE27 – Engineering Geology/SWAYAM*	2	0	2	3
2	CE-422OA/ CE-422B/	ELECTIVE-30- DSE 28– SWAYAM Course ELECTIVE-31- DSE29- Earthquake Resistance Structures	3	0	0	3
3	CE-423OA/ CE-423B	ELECTIVE-32- DSE30 – SWAYAM Course ELECTIVE-33- DSE31- Basic of Bridge Engineering	3	0	0	3
4	CE-4202	AP2-07 VAC7 - Major Project-II	0	0	6	3
5	CE-420H	Computational Fluid Dynamics/SWAYAM	3	0	0	3*
Contact Hours			12/11	0	6/8	
*Credit for B. Tech (Hons)						
Total Credits						12

* Students who will go for Internship required for joining a job may opt for equivalent SWAYAM Course

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Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation			2025-29		
Department		Civil Engineering									Semester			VIII		
Course Code		Course Name						Credit Structure				Marks Distribution				
								L	T	P	C	INT	MID	END	Total	
CE- 422B		ELECTIVE-31- DSE29-Earthquake Resistant Structures						3	0	0	3	20	30	50	100	
Course Objectives		1. To introduce the basics of Earthquake Engineering.						Course Outcomes	CO1	1. At the end of the course, student will be able to: Apply the basics of Earthquake Engineering.						
		2. To introduce the engineering seismology, building geometrics & characteristics, structural irregularities.							CO2	2. At the end of the course, student will be able to: Demonstrate the dynamics of structural system under earthquake load.						
		3. To introduce tips on earthquake engineering - do's and don'ts.							CO3	3. At the end of the course, Student will be able to: Analyze the influence of the structural/geometrical design in building characteristics.						
		4. To introduce cyclic loading behaviour of RC, steel and pre-stressed concrete elements.							CO4	4. At the end of the course, student will be able to: Demonstrate the cyclic loading behaviour of RC steel and pre-stressed concrete element.						
		5. To discuss code provisions and their application on different types of structures.							CO5	5. At the end of the course, student will be able to: Apply Codal provisions on different types of structures.						
No.	COs	Mapping with Program Outcomes (POs)											Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	
1	CO1	3	3	3	1	3	1	--	-	1	2	1	2	2	1	
2	CO2	3	3	3	2	3	1	-	-	1	3	2	2	2	2	
3	CO3	3	3	3	1	3	1	-	-	1	2	1	2	2	1	
4	CO4	3	3	3	2	3	1	-	-	1	3	2	2	2	2	
5	CO5	3	3	3	1	3	1	-	-	1	3	2	2	2	2	
SYLLABUS																
No.	Content												Hours		COs	
1.	Elements of Engineering Seismology Theory of Vibrations -Indian Seismicity Earthquake History - Behavior of structures in the past Earthquakes												45		CO1	
2.	Seismic Design Concepts Cyclic loading behavior of RC, Steel and Prestressed Concrete elements - Response Spectrum- Design spectrum capacity based design														CO2	
3.	Provision of Seismic Code frames, shear walls, Braced frames, Combinations -Torsion.														CO3	
4.	Performance of Regular Buildings 3D Computer Analysis of Building Systems (Theory only) - Design and Detailing of frames - Shear walls and Frame walls.														CO4	
5.	Seismic performance Irregular Buildings -Soil performance, Modern Concepts Base Isolation - Adoptive systems - Case studies.														CO5	
Total Hours												45				
Text Books:																
1. Pankaj Agarwal and Manish ShriKhande, Earthquake Resistant Design of Structures, Prentice- Hall of India, New Delhi, 2003.																
2. Paulay.T and Priestley M.J.N., “Seismic Design of Reinforced Concrete and MasonryBuildings”, John Wiley and Sons, 2013.																
3. Duggal S K, “Earthquake Resistant Design of Structures”, Oxford University Press, 2013																
Reference Books:																
1. Bullen K.E., Introduction to the Theory of Seismology, Great Britain at the University Printing houses, Cambridge University Press 1996.																
2. Mohiuddin Ali Khan “Earthquake-Resistant Structures: Design, Build and Retrofit”, Elsevier Science& Technology, 2013																
3. Brebbia C. A.,” Earthquake Resistant Engineering Structures VIII”, WIT Press, 2015.																

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Programme		Bachelor of Technology in Civil Engineering										Academic Year of Regulation			2025-29		
Department		Civil Engineering										Semester			VIII		
Course Code		Course Name						Credit Structure				Marks Distribution					
								L	T	P	C	INT	MID	END	Total		
CE- 423B		ELECTIVE-33- DSE31- Basis of Bridge Engineering						3	0	0	3	20	30	50	100		
Course Objectives		1. To learn the components of bridges, classification of bridges, importance of bridges.						Course Outcomes	CO1	1. At the end of the course, student will be able to: familiar with the components of bridges, classification of bridges, importance of bridges							
		2. To study the specification of road bridges, loads to be considered							CO2	2. At the end of the course, student will be able to: understand the specification of road bridges, loads to be considered.							
		3. To familiarize students with various types of concrete bridges such as slab-bridge, T-beam bridge.							CO3	3. At the end of the course, Student will be able to: familiar with various types of concrete bridges such as slab-bridge, T beam bridge, pre-stressed concrete bridge.							
		4. To familiarize students with various types of steel bridges such as truss bridge and girder bridge and also railway bridges by IRS loadings							CO4	4. At the end of the course, student will be able to: familiar with various types of steel bridges such truss bridge and girder bridge.							
		5. To get exposure the substructure of bridge substructures and the evaluation and importance of bearings							CO5	5. At the end of the course, student will be able to: get exposed to evaluation of sub structures, type of foundations, importance of bearings.							
No.	COs	Mapping with Program Outcomes (POs)											Mapping with PSOs				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3		
1	CO1	3	3	3	1	3	1	--	-	1	2	1	2	2	1		
2	CO2	3	3	3	2	3	1	-	-	1	3	2	2	2	2		
3	CO3	3	3	3	1	3	1	-	-	1	2	1	2	2	1		
4	CO4	3	3	3	2	3	1	-	-	1	3	2	2	2	2		
5	CO5	3	3	3	1	3	1	-	-	1	3	2	2	2	2		
SYLLABUS																	
No.	Content												Hours		COs		
1.	Components of Bridges –Classification –Importance of Bridges –Investigation for Bridges –Selection of Bridge site – Economical span –Choice of bridge type.												45		CO1		
2.	Specification of road bridges –width of carriageway –loads to be considered -dead load –IRC standard live load and IRS loading–Impact effect														CO2		
3.	General design considerations –Concrete bridges - Slab Bridge –Design of T- beam bridge (superstructure only)														CO3		
4.	Steel bridges - truss bridge-plate girder bridge (superstructure only)														CO4		
5.	Importance of Bearings –Bearings for slab bridges –Bearings for girder bridges –Electrometric bearing –Joints –Expansion joints – substructure (theory only): piers, pier caps, types of foundations, piles and pile caps.														CO5		
Total Hours												45					
Text Books:																	
1. Pankaj Agarwal and Manish ShriKhande, Earthquake Resistant Design of Structures, Prentice- Hall of India, New Delhi, 2003.																	
2. Paulay.T and Priestley M.J.N., “Seismic Design of Reinforced Concrete and MasonryBuildings”, John Wiley and Sons, 2013.																	
3. Duggal S K, “Earthquake Resistant Design of Structures”, Oxford University Press, 2013																	
Reference Books:																	
1. Bullen K.E., Introduction to the Theory of Seismology, Great Britain at the University Printing houses, Cambridge University Press 1996.																	
2. Mohiuddin Ali Khan “Earthquake-Resistant Structures: Design, Build and Retrofit”, Elsevier Science& Technology, 2013																	
3. Brebbia C. A.,” Earthquake Resistant Engineering Structures VIII”, WIT Press, 2015.																	

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Programme		Bachelor of Technology in Civil Engineering										Academic Year of Regulation				2025-29		
Department		Civil Engineering										Semester				III		
Course Code		Course Name						Credit Structure				Marks Distribution						
								L	T	P	C	INT	MID	END	Total			
CE- 210M		Environmental Science and Engineering						3	0	0	3	20	30	50	100			
Course Objectives		To develop understanding of atmospheric science including quantifying climate sensitivity to changes in greenhouse gases and interrelation between the various components of the climate system. 2. To define and classify natural water sources, water demand, population forecasting 3. To study the various water treatment methods for drinking and waste water 4. To understand and study the urban - rural sanitation system						Course Outcomes	CO1	1. Will understand source and cycle of water in our environment,								
									CO2	2. Comprehensive overview of the water supply system and its design its flow and efficiency								
									CO3	3. Understand the fundamental principles of existing and emerging technologies for the treatment of water								
									CO4	4. Deal with the various rural and urban sanitation systems								
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3		
1	CO1	3	1	0	0	0	1	3	0	1	1	0	2	3	3	3		
2	CO2	3	1	0	1	2	1	2	0	1	2	0	2	3	3	3		
3	CO3	3	1	2	1	2	1	2	0	1	2	0	2	3	3	3		
4	CO4	3	1	0	0	0	2	3	0	1	2	0	2	3	3	3		
SYLLABUS																		
No.	Content												Hours		COs			
I	Introduction: Environment and ecology, source of water, water demand and supply, population forecasting, design period. Physical chemical and biological characteristics of water and waste water, chemical significance of pollutant parameters and effluent discharge standards.												5		CO1, CO2, CO3			
II	Primary treatment: screening, neutralization, equalization, flocculation, sedimentation, floatation, stripping. Tertiary treatment: Oxidation/reduction, precipitation, adsorption, ion exchange and membrane processes, disinfection												8		CO2			
III	Policies for solid waste: MSW, C&D, Plastic waste, Bio-medical waste, E-waste, Collection and handling of above-mentioned waste types may also be included in the syllabus,												8		CO3			
IV	Water distribution systems: different pipe systems, design considerations, laying, testing and effects of pipe corrosion and its preventive measures. Sewers: hydraulic design, construction and appurtenances, operation and maintenance. Pumps and pumping: necessity, types of pumps, characteristics curves, selection criteria, economical diameter of pumping/transmission main, problems in sewage pumping												10		CO3			
VI	Rural and Semi urban sanitation: Collection and disposal of dry refuse, sullage, excretal waste, night soil disposal without water carriage, latrines, chemical toilets, precast units for low cost sanitation. Management of municipal solid waste (MSW), source, method of collection, disposal, landfill types.												5		CO2, CO4			
V	Air pollution: Fundamentals of air pollutants and impact, ambient air monitoring, emission factors; overview of prediction models, air pollution control techniques, suppression and consolidation of dust.												5		CO3			
VI	Noise Pollution: Fundamentals of Noise Pollution and Impact, monitoring and control measures												4		CO3			
Total Hours												45						
Text Books:																		
1. Punmia B.C., Environmental Engg. (Vol. I), Laxmi Publications, 2005.																		
2. Garg S.K., Water Supply Engg. (Vol. I), Khanna Publications, 2003.																		
Reference Books:																		
1. Peavy & Rowe, Environmental Engineering, McGraw Hill Publications, 2017.																		
2. Birdie G.S., Water Supply, Dhanpath Roy publication, 2017.																		
3. Davis M. L., Cornwell A. A., Introduction to environmental engineering, Mc Graw Hill publishers, 2014.																		

राष्ट्रीयप्रौद्योगिकीसंस्थानअरुणाचलप्रदेश

NATIONAL INSTITUTE OF TECHNOLOGY ARUNACHAL PRADESH

(शिक्षामंत्रालय, भारत सरकारके तहत राष्ट्रीय महत्वका संस्थान)

(Institute of National Importance under Ministry of Education, Govt. of India)

CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				IV		
Course Code		Course Name							Credit Structure				Marks Distribution				
									L	T	P	C	INT	MID	END	Total	
CE- 220M		Soil Mechanics and Foundation Engineering							3	0	0	3	20	30	50	100	
Course Objectives		1. To have impart the knowledge about the origin of soil							Course Outcomes	CO1	Characterize and classify the soil.						
		2. To know how to classify the soil.								CO2	Calculate the stress distribution and effective stress under various field conditions and estimate the consolidation settlements.						
		3. To have idea about the soil, air water relationship								CO3	Select the suitable shear strength parameters for different field conditions.						
		4. To have idea of the different properties of soil								CO4	Determine the compaction parameters and exercise field compaction control						
		5. To inculcate research directions in the field of Geotechnical Engineering								CO5	Understand the permeability and seepage behavior of the soil.						
										CO6	Understand of consolidation Terzaghi theory						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	3	1	0	3	2	1	2	1	1	2	1	2	3	3	3	
2	CO2	3	3	0	2	2	1	2	1	1	2	1	2	3	3	3	
3	CO3	3	1	0	3	2	1	2	1	1	2	1	2	3	3	3	
4	CO4	3	3	0	3	2	2	3	2	1	2	1	2	3	3	3	
5	CO5	1	-	0	2	2	1	2	1	1	2	1	2	3	3	3	
6	CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SYLLABUS																	
No.	Content													Hours		COs	
I	Origin, Index Properties and Classification: Identification and classification of soils, Index properties, phase relationship, consistency, sensitivity, clay mineralogy, IS Codal provisions for assessing various index properties.													8		CO1	
II	Permeability and Seepage: Darcy’s law of permeability, Determination of Coefficient of permeability, IS Codal provisions for assessing permeability, Equivalent permeability for stratified soil.													5		CO5	
III	Flow nets – principles, construction and application, Effective stress analysis, quick sand condition, piping, filtration criteria.													5		CO5	
IV	Effective stress and Stress Distribution: Effective stress and pore-water pressure, Effective stresses during drained and undrained condition, Capillarity in soils. Stress distribution due to surface loads: Boussinesq and Westergaard analysis for point loads, Line loads, strip loads; Stresses beneath a circular, rectangular and irregular shaped foundations, Stress distribution by 2:1 theory, Pressure isobars													5		CO2	
V	Compaction: Principle of compaction, Light and heavy compaction, field compaction control, factors affecting compaction, effect of compaction on soil properties. Compaction of cohesionless soil, relative density, IS Codal provisions for assessing compaction.													5		CO4	
VI	Compressibility and Consolidation: Terzaghi’s theory of one-dimensional consolidation, Secondary Consolidation, Consolidometer, Assessment of various consolidation parameters through laboratory test and results (Cc, Cv, mv, av, e-p and e-log p), assessment of preconsolidation pressure from consolidation test, estimation of consolidation settlement due to primary and secondary compression, introduction to two- and three-dimensional consolidation, IS Codal provisions for assessing consolidation.													9		CO4	
VII	Shear Strength of Soil: Strength envelope, Mohr’s circle of stresses, total and effective stress paths, pore pressure, evaluation of shear strength parameters by direct shear, triaxial shear, vane shear, and unconfined compression strength tests, IS Codal provisions for assessing various shear strength properties.													8		CO3	
Total Hours													45				
Text Books:																	
1. Ranjan G., Rao A S R., Basic and applied soil Mechanics, New age international Publishers, 2016																	
2. Punmia B.C., Jain K A., Soil Mechanics and foundations, Laxmi Publishers, 2017																	
3. Murthy V N S P., Geotechnical Engineering, UBS publishers, 2019																	
Reference Books:																	
1. Arora K.R., Soil Mechanics and Foundation Engineering, PHI publishers,2016.																	
2. Das M. B., Fundamentals of Geotechnical Engineering, Cengage learning, 2010																	



राष्ट्रीय प्रौद्योगिकी संस्थान अरुणाचलप्रदेश
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 (Institute of National Importance under Ministry of Education, Govt. of India)

CURRICULUM

Programme		Bachelor of Technology in Civil Engineering									Academic Year of Regulation				2025-29		
Department		Civil Engineering									Semester				V		
Course Code		Course Name							Credit Structure				Marks Distribution				
									L	T	P	C	INT	MID	END	Total	
CE- 410M		TRANSPORTATION ENGINEERING							3	0	0	3	20	30	50	100	
Course Objectives		1. Provide a systematic understanding of the causes and motivations of Highway location, planning and geometric design.							Course Outcomes	CO1	Students will idea about the history of road development and planning in India.						
		2. To have idea about road planning and development.								CO2	Students will be confident in flexible and rigid pavement designing						
		3. To have idea about the pavement design and pavement materials.								CO3	Students will have idea about the construction of highways.						
		4. To have idea about the hill roads and highway maintenance.								CO4	Students will be able to do planning and development of hill road.						
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1		2	2	1	-	-	-	-	-	-	-	1	3	2		
2	CO2		2	3	1	-	-	-	-	-	-	-	1	3	2	2	
3	CO3	3	2	3	1	1	-	-	-	-	-	-	1	3	2	2	
4	CO4		2	3	1	1	-	-	-	-	-	-	1	3	2		
SYLLABUS																	
No.	Content													Hours		COs	
I	Road development and planning: Brief history of road development, Road cross section, necessity of transportation planning, classification of roads, road patterns, planning surveys, saturation system, highway planning in India, road development plans.													45		CO1	
II	Highway location and alignment: Basic requirements of an ideal alignment and factors controlling, engineering survey for highway location, drawing and reports, highway projects.															CO1	
III	Highway geometric design: Highway cross section elements, sight distances, Design of horizontal alignment, Transition curves and vertical alignment.															CO2	
IV	Pavements design: Design factors, Design of flexible pavements, CBR, GI and Burmister methods, Design of rigid pavements.															CO3	

V	Pavement materials: Soils, Aggregates and their characteristics, bituminous materials and mixtures, Portland cement concrete.		CO3
VI	Hill roads: General considerations, alignment, geometric design and construction, drainage, and maintenance problems in hill roads. Highway maintenance: Pavement failures, maintenance of highway pavement, evaluation and strengthening of existing pavements.		CO4
Total Hours		45	
Text Books:			
1. Khanna K S., Justo C E G., Veeragavan A., Highway Engineering, Nem Chand & Bros, 2020			
2. Kadiyali R. L., Transportation Engineering, Khanna Publishers, 2021			
3. enkatramiah C., Transportation Engineering (Highway Engineering), Orient Blackswan private limited, 2015.			
Reference Books:			
1. Papacostas S C., Prevedouros D P., Transportation Engineering, PHI publishers,2016			
2. Chakroborty P., Principles of Transportation Engineering, PHI publishers,2020.			