MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous Institute affiliated to RGPV, Bhopal)

NAAC Accredited with A++ Grade

Department of Civil Engineering

Scheme of Evaluation

B. Tech. I Semester *CIVIL ENGINEERING*

(for batch admitted in academic session 2022-23)

No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam	Continuous Evaluation			L	T	P				
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	2100011	BSC	Engineering Mathematics – I (BSC - 1)	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP	2 Hrs
2.	2160122	ESC	Computer Programming (ESC - 1)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	AO	2 Hrs
3.	2100014	ESC	Engineering Graphics (ESC - 2)	50	10	20	20	-	-	-	100	1	2	-	3	Offline	AO	2 Hrs
4.	2110121	DC	Building Materials & Construction (DC - 1)	50	10	20	20	60	20	20	200	3	-	2	4	Blended	PP	2 Hrs
5.	2110122	DC	Engineering Mechanics (DC - 2)	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP	2 Hrs
6.	2100018	ESC	Engineering Graphics Lab (ESC – 3)	-	-	-	-	60	20	20	100	-	-	2	1	Offline	SO	-
Total				**250**	**50**	**100**	**100**	**180**	**60**	**60**	**800**	**12**	**4**	**6**	**19**	-	-	-
7.	3000003	Natural Sciences & Skills	Environmental Engineering	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs
Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.																		

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language, Credits of natural Sciences & Skills will be added in VI Semester.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ	SO	
7		9	3	10	6		3	19
37%		49%	16%	51%	33%		16%	Credits %

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Department of Civil Engineering

Scheme of Evaluation

B. Tech. II Semester *CIVIL ENGINEERING*

(for batch admitted in academic session 2022-23)

No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam.
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam	Continuous Evaluation			L	T	P				
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project								
1.	2110221	DC	Surveying (DC - 3)	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP	2 Hrs
2.	2110222	DC	Strength of Materials (DC - 4)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
3.	2100021	ESC	Basic Mechanical Engineering (ESC - 4)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	MCQ	1.5 Hrs
4.	2100022	ESC	Basic Electrical & Electronics Engineering (ESC - 5)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	MCQ	1.5 Hrs
5.	2160222	ESC	Python Programming (ESC - 6)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	AO	2 Hrs
6.	2110223	DLC	Survey Practice Lab (DLC – 2)	-	-	-	-	60	20	20	100	-	-	2	1	Offline	SO	-
Total				**250**	**50**	**100**	**100**	**240**	**80**	**80**	**900**	**11**	**4**	**8**	**19**	-	-	-
7.	3000004	Natural Sciences & Skills	Language	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs
Summer Internship Project – I (Institute Level) (Qualifier): Minimum two-week duration: Evaluation in III Semester.																		

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language, Credits of natural Sciences & Skills will be added in VI Semester.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination				Total Credits
Theory			Lab	Theory			Lab	
Offline	Online	Blended	Offline	PP	AO	MCQ	SO	
		15	4	6	3	6	4	19
		89%	21%	32%	15%	32%	21%	Credits %

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Department of Civil Engineering

Scheme of Evaluation

B. Tech. III Semester *CIVIL ENGINEERING*

(for batch admitted in academic session 2022-23)

No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam	Duration of Exam
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam	Continuous Evaluation									
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project		L	T	P				
1.	2100025	BSC	Engineering Mathematics - II (BSC - 2)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
2.	2110321	DC	Fluid Mechanics - I (DC - 5)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
3.	2110322	DC	Theory of Structure – I (DC - 6)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
4.	2110323	DC	Geotechnical Engineering (DC - 7)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	MCQ	1.5 Hrs
5.	2110324	DC	Transportation Engineering (DC - 8)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	MCQ	1.5 Hrs
6.	2110325	DLC	Self-learning /Presentation (SWAYAM/NPTEL/MOOC)*	-	-	-	-	-	40	-	40	-	-	2	1	Online + Mentoring	SO	-
7.	2110326	DLC	Summer Internship Project–I (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO	-
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO	-
Total				**250**	**50**	**100**	**100**	**290**	**100**	**60**	**950**	**10**	**5**	**14**	**22**	-	-	-
9.	3000001	Natural Sciences & Skills	Engineering Physics	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs
10.	1000005	MAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs

***compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation**

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language, Credits of natural Sciences & Skills will be added in VI Semester.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching						Mode of Examination					Total Credits
Theory			Lab/SIP	Seminar	NEC	Theory			Lab	SIP/SLP/NEC	
Offline	Online	Blended	Offline	Online Mentoring	Interactive	PP	AO	MCQ	SO	SO	
		15	5	1	1	9		6	3	4	22
		68%	22%	5%	5%	41%		27%	13%	19%	Credits %

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Department of Civil Engineering

Scheme of Evaluation

B. Tech. IV Semester *CIVIL ENGINEERING*

(for batch admitted in academic session 2022-23)

No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam	Duration of Exam
				Theory Slot				Practical Slot										
				End Term Evaluation		Continuous Evaluation		End Sem. Exam	Continuous Evaluation									
				End Sem. Exam	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project		L	T	P				
1.	2100028	BSC	Engineering Mathematics - III (BSC – 4)	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP	2 Hrs
2.	2110421	DC	Fluid Mechanics - II (DC - 9)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
3.	2110422	DC	Theory of Structure – II (DC - 10)	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP	2 Hrs
4.	2110423	DC	Water Supply Engineering (DC - 11)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
5.	2110424	DC	Water Resources Engineering (DC - 12)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
6.	2110425	DLC	Civil Drawing Lab (DLC – 3)	-	-	-	-	60	20	20	100	-	-	2	1	Offline	SO	-
7.	2110426	MC	Cyber Security	50	10	20	20	-	-	-	100	2	-	-	2	Online	MCQ	1.5 Hrs
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO	-
Total				**300**	**60**	**120**	**120**	**170**	**40**	**40**	**850**	**12**	**5**	**6**	**20**	-	-	-
9.	3000002	Natural Sciences & Skills	Engineering Chemistry	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs
10.	1000001	MAC	Indian Constitution & Traditional Knowledge	50	10	20	20	-	-	-	100	2	-	-	GRADE	Online	MCQ	1.5 Hrs

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language, Credits of natural Sciences & Skills will be added in VI Semester.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching						Mode of Examination					Total Credits
Theory			Lab/SIP	Seminar	NEC	Theory			Lab	SIP/SLP/NEC	
Offline	Online	Blended	Offline	Online Mentoring	Interactive	PP	AO	MCQ	SO	SO	
6	2	9	2		1	15		2	2	1	20
30%	10%	45%	10%		5%	75%		10%	10%	5%	Credits %

DEPARTMENT OF CIVIL ENGINEERING
Scheme of Evaluation
B. Tech. V Semester (Civil Engineering)

For batches admitted in academic session 2022 – 23 onwards

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam
				Theory Slot				Practical Slot									
				End Term Evaluation		Continuous Evaluation		End Sem Exam	Continuous Evaluation			L	T	P			
				End Sem Exam	$Proficiency in subject /course	Mid Sem	Quiz/ Assign ment		Lab Work & Sessional	Skill Based Mini Project							
1.	2110520	MC	Data Science	50	10	20	20	60	20	20	200	3	0	2	4	Blended	MCQ
2.	2110511	DC	Wastewater Engineering (DC - 10)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP
3.	2110512	DC	Estimating Costing & Contracting (DC - 11)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP
4.	2110513	DC	Structural Design & Drawing (RCC) (DC - 12)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP
5.	2110514	DC	Railway, Airport and Tunnel Engineering (DC - 13)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP
6.	2110515	DLC	Minor Project – I (DLC – 3)**	-	-	-	-	60	40	-	100	-	-	4	2	Offline	SO
7.	2110516	DLC	Self-learning /Presentation (SWAYAM /NPTEL/ MOOC)*	-	-	-	-	-	40	-	40	-	-	2	1	Online + Mentoring	SO
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	2110517	DLC	Summer Internship Project–II (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
Total				250	50	100	100	230	100	20	850	11	4	14	22	-	-
10.	1000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	Grade	Blended	MCQ
Additional Courses for obtaining Honours or Minor Specialization				Permitted to opt for maximum 02 additional courses for the award of Honours or Minor Specialization													

*compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competence /knowledge level /expertise attained /attendance etc. in that particular course/subject

MCQ – Multiple Choice Questions, PP – Pen paper Mode, A+O – Assignment + Oral, SO – Submission + Oral

Note: Students of 2020-21 admitted batch needs to appear and complete an additional MAC course of 30 Hrs. duration on Project Management & Financing. / other modules related to futuristic technologies (Drones/ Robotics etc.)

** The Minor Project-I may be evaluated by an internal committee for awarding sessional marks.

Mode of Teaching						Mode of Examination					Total Credits
Theory			Lab / SIP	Seminar	NEC	Theory			Lab	SIP/SLP/NEC	
Offline	Online	Blended	Offline	Online Mentoring	Interactive	PP	A+O	MCQ	SO	SO	
-	-	15	5	1	1	12	-	3	4	3	22
-	-	68%	23%	4.5%	4.5%	54%	-	14%	18%	14%	Credits %

Scheme of Evaluation
B. Tech. VI Semester (Civil Engineering)

For batches admitted in academic session 2022 – 23

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam	Duration of Exam
				Theory Slot				Practical Slot			MOOCS			L	T	P				
				End Sem.		Mid Sem	Quiz/ Assignment	End Sem	Lab Work & Sessional	Skill Based Mini Project	Assignment	Exam								
				End Term Evaluation	$Proficiency in subject /course															
1.	2110620	MC	Artificial Intelligence & Machine Learning	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended	MCQ	1.5 Hrs
2.	2110621	DC	Solid & Hazardous Waste management (DC - 14)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	MCQ	1.5 Hrs
3.	2110622	DC	Structural Design & Drawing (Steel) (DC - 15)	50	10	20	20	-	-	-	-	-	100	3	1	-	4	Blended	PP	2 Hrs
4.	21106XX	DE	Departmental Elective - I (DE - 1)*	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
5.	910XXX	OC	Open Category Course – I (OC - 1)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	PP	2 Hrs
6.	2110623	DLC	Minor Project - II (DLC – 4)	-	-	-	-	60	40	-	-	-	100	-	-	4	2	Offline	SO	-
7.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	-	-	50	-	-	2	1	Interactive	SO	-
8.		NSS	**Natural Sciences & Skills	200	40	80	80	120	40	40	-	-	600	1	-	2	2*	-	-	
Total				400	80	160	160	290	100	60	25	75	1350	15	1	8	22	-	-	
9.	1000007	MAC	Intellectual Property Rights	50	10	20	20	-	-	-	-	-	100	2	-	-	Grade	Online	MCQ	1.5 Hrs
Additional Courses for obtaining Honours or Minor Specialization				Permitted to opt for maximum 02 additional courses for the award of Honours or Minor Specialization																
Summer Internship Project – III (On Job Training) for four weeks duration: Evaluation in VII Semester																				

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competence /knowledge level /expertise attained /attendance etc. in that particular course/subject
MCQ – Multiple Choice Questions, PP – Pen paper Mode, A+O – Assignment + Oral, SO – Submission + Oral
*Course will run through SWAYAM/NPTEL/MOOC with credit transfer
**Natural Sciences& Skills: Engineering Physics / Engineering Chemistry / Environmental Science/ Language
("Natural Sciences & Skills" treated as Mandatory Audit Courses from first to fourth semester and cumulative marks converted as a cluster of credits and awarded in the VI semester)

Mode of Teaching						Mode of Examination					Total Credits
Theory			Lab	MOOC	NEC	Theory			Lab	SIP/SLP/NEC	
Offline	Online	Blended	Offline	Online Mentoring	Interactive	PP	A+O	MCQ	SO	SO	
		13	3	3	1	7	-	9	3	1	22
-	-	65%	15%	15%	5%	35%	-	45%	15%	5%	Credits %

Departmental Elective I (SWAYAM/NPTEL) (DE-1)
1. 2110661, Geotechnical Engineering II – Foundation Engineering
2. 2110662, Remote Sensing and GIS for Rural Development

Open Category Course – I (OC-1)
1. 910111, Building Maintenance & Services
2. 910110, Sustainable Materials & Green Buildings

माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA

Deemed to be University

(Declared under Distinct Category by Ministry of Education, Government of India)

NAAC ACCREDITED WITH A++ GRADE

Scheme of Evaluation

B. Tech. VII Semester *(Civil Engineering)*

(for batch admitted in academic session 2022 – 23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam
				Theory Slot				Practical Slot			MOOCs			L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam							
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	21107XX	DE	*Departmental Elective(DE-2)	-	-	-	-	-	-	-	25	75	100	4	-	-	**4**	Blended	MCQ
2.	21107XX	DE	*Departmental Elective (DE-3)	-	-	-	-	-	-	-	25	75	100	3	-	-	**3**	Blended	MCQ
3.	910XXX	OC	#Open Category (OC-2)	50	10	20	20	-	-	-	-	-	100	3	-	-	**3**	Blended	MCQ
4.	2110711	DLC	Software Application for Solving Civil Engineering Problem (DLC-5)	-	-	-	-	60	20	20	-	-	100	-	-	4	**2**	Offline	SO
5.	2110712	DLC	Creative Problem Solving (DLC-6)	-	-	-	-	25	25	-	-	-	50	-	-	4	**2**	Offline	SO
6.	2110713	DLC	**Professional Skills & Competencies (DLC-7)	-	-	-	-	40	60	-	-	-	100	-	-	4	**2**	Offline	MCQ
7.	2110714	DLC	Summer Internship Project-III (04 weeks) (Evaluation)	-	-	-	-	60	-	-	-	-	60	-	-	4	**2**	Interactive	SO
Total				**50**	**10**	**20**	**20**	**185**	**105**	**20**	**50**	**150**	**610**	**10**	**-**	**16**	**18**		
8.	1000008	**MAC**	Universal Human Values & Professional Ethics (UHVPE)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Blended	MCQ
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**															

$Proficiency in subject / course – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained, etc. in that particular course/subject

**** Professional Skills & Competencies will include and prepare the students on coding skills, technical proficiency (industry readiness and higher studies), aptitude, communication & soft skill set, etc.**

***Course will run through SWAYAM/NPTEL platform with credit transfer**

#Course will run through MITS MOOCs

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching			Mode of Examination				Total Credits
Offline	**Blended**	**Interactive**	**PP**	**AO**	**MCQ**	**SO**	
6	10	2	-	-	12	6	**18**
33.33%	55.56%	11.11%	-	-	66.67%	33.33%	**100 %**

DE – 2 (Through SWAYAM/NPTEL)	DE – 3 (Through SWAYAM/ NPTEL)	OC – 2
2110761. Foundation Engineering	**2110765.** Principles of Construction Management	**910211** Integrated Waste Management for Smart City
2110762. Pavement Construction Technology	**2110766.** Remote Sensing & GIS	**910xx** Traffic engineering and Design
2110763. Admixtures and Special Concretes	**2110767.** River Engineering	
2110764. Ground Improvement		

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DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS B.Tech Civil Engineering

2022 ONWARDS ADMITTED BATCHES

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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SEMESTER-I & II

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Course Code: 2110121
Course Name: Building Materials & Construction

L	T	P	Credit
3	0	2	4

Course Objectives:

1. To study the properties of concrete ingredients i.e. cement. Sand and coarse aggregate by conducting different tests.
2. To select of different types of admixtures to improve the properties of concrete for different field applications.
3. To conduct the field and laboratory tests on concrete in fresh and hardened state.
4. To provide knowledge about various types of bricks, stones, woods & timber, ferrous & nonferrous construction material & their applications.
5. To provide knowledge on design of foundation, including selection of appropriate foundation.
6. To understand laying & construction of brick & stone masonry and various methods of damp proofing etc.
7. To provide knowledge about stairs, floors & roofs in various types of buildings.

Syllabus:

Unit-I

Types of Foundation& its design: masonry construction, masonry classification, stone v/s brick masonry, joints in stone masonry, brick masonry (bonds in brick masonry, characteristics of bonds, type of bonds), typical structures in brickwork, Damp prevention (causes, effects, control & prevention techniques, material used for damp proofing), Anti termite treatment, water proofing treatment, Arches & lintels, stair & stair case, (types & design of stair case), Types of floor & flooring, Roof & roof covering.

Unit – II

Ingredients of Concrete**:** Portland cement Chemical composition of cement, Hydration of cement, setting of cement, tests on physical properties of cement. Types of Portland cement – Ordinary Portland cement – Rapid Hardening Portland cement – low heat Portland cement- Sulphate Resisting cement – Portland Blast furnace cement- Super Sulphated cement- Portland Pozzolana cement and Pozzolanas: Fly ash; use of pozzolanas, white cement, Expansive cements – High alumina cement.

Aggregates**:** General classification of aggregates, natural and artificial aggregates, particle shape and texture, strength of aggregate, Mechanical properties of aggregate, specific gravity, Bulk density, porosity and absorption of aggregate, moisture content of aggregate, Bulking of sand deleterious substances in aggregates, Soundness of aggregates, Alkali- aggregate reaction, Fineness modulus, Grading requirements.

Admixtures**:** Introduction, functions of admixtures, classification of admixtures, Accelerators, Retarders, Water Reducing Agents, Super plasticizers, air entraining admixtures.

Unit-III

Fresh and Hardened Concrete: Fresh Concrete**,** Workability of concrete, factors affecting workability, measurement of workability using slump test, Compaction factor test, Flow test, Vee-Bee Test, Ball penetration test, Segregation and Bleeding of concrete, process of concrete manufacturing.

Hardened Concrete**:** Compressive & Flexural strength of concrete, drying shrinkage of concrete, Creep of concrete, Permeability and durability of concrete, Thermal properties of concrete.

Unit IV

Bricks (classification, characteristics, manufacturing, testing, and types). Stones (classification, Quarrying, seasoning characteristics, testing, selection & uses, preservation)**,** Wood & Timber (Classification, Structure & characteristics, seasoning and its methods, defects & diseases, preservation & various treatment testing), wood products and their applications

Unit V

Mortar (Classification, characteristics, functions of ingredients). Types of mortar and their uses grout, guniting, ferrous material (Pig iron, CI, Mild steel, wrought iron, stainless steel, compositions & proposition). Reinforced steel bars (classification, types, designation), Aluminium (its alloys & uses). Copper (its alloys & uses), Ceramics (classification, properties, commercial forms), Paint varnishes & enamels (types, composition, method of application, defects)

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Explain the basic elements of buildings, engg. materials & construction.
CO2: Evaluate the properties of various materials like cement, aggregate, concrete, admixture, brick, stone etc.
CO3: Distinguish the suitability of building materials in the construction of elements of buildings.
CO4: Evaluate various types of concrete in building construction accordingly.
CO5: Apply various techniques for finishing & protection works of various elements of building.

Text Books:

1. Concrete Technology, M. L. Gambhir, Tata McGraw Hill education Pvt. Ltd., 5th edition 2013
2. Concrete Technology, M.S. Shetty, S. Chand Publications, 2006
3. Building Materials, M.L. Gambhir, Tata McGraw Hill education Pvt. Ltd., 2017
4. Building Construction, B.C. Punmia, A.K. Jain, Laxmi Publishers New Delhi, 2016

Reference Books:

1. Properties of Concrete, Neville, ELBS, Pearson Education, 5th edition 2012
2. Building Material, S.K. Duggal, New Age Publishers, 4th revised edition 2012

List of Experiments:

1. Determination of properties of cement.
2. Determination of properties of sand.
3. Determination of properties of aggregate.
4. Determination of Fineness of cement.
5. Determination of consistency of cement.
6. Determination of workability of concrete by slump test.

7. Determination of workability of concrete by compacting factor apparatus.
8. Determination of workability by Vee Bee consistometer.
9. Determination of water absorption of bricks.
10. Determination of efflorescence of brick.
11. Field testing on bricks.
12. Determination of crushing strength of bricks.

Upon completion of practical course, the students will be able to:

CO 1: Determine the properties of cement, sand & aggregate as per IS code.

CO 2: Determine the workability of concrete for suitability of concrete mix in different construction works.

CO 3: Evaluate compressive strength of various concrete mixes.

CO 4: Determine physical properties of brick by experiment and practice accordingly.

CO 5: Examine the properties of the cement mortar for various elements of the buildings.

Suggestive List of Skill Based Mini Project:

1. Mix Design – (M20 & M25)
2. Fresh & Hardened Concrete Design.
3. Development of Innovative Building Materials like brick etc using waste materials.

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Course Code: 2110122

Course Name: Engineering Mechanics

L	T	P	Credit
3	0	0	3

COURSE OBJECTIVES:

1. To learn about basic laws of Mechanics and its application for different types of force systems.
2. To learn the Laws of friction and its applications
3. To study the applications of equilibrium concepts in Engineering problems.
4. To study about properties of areas like Centroid and Moment of Inertia.
5. To learn the basics of kinematics and Kinetics of particles and its applications in free vibration.

SYLLABUS

Unit-I

Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non-concurrent coplanar forces, free body Diagram, Force Diagram and Bow's notations, Introduction to force system in space; Equilibrium Concepts.

Unit-II

Equilibrium Problem involving Frictional forces, Friction: Laws of Coulomb friction, inclined plane; ladder friction; wedge friction, square threaded screws; belt friction; rolling resistance

Unit-III

Support Reactions, Analysis of plane Trusses, method of joints, method of Sections, Graphical method. Shear force and bending moment diagram for cantilever, simply supported and overhanging beam with concentrated, distributed load and Couple.

Unit-IV

Properties of areas: Centroid of plane areas, Moments of inertia, theorem of parallel axis and theorem of perpendicular axis; product of inertia of areas, polar moment of inertia, principal axes and principal moments of inertia.

Unit-V

Kinematics and Kinetics of particles: Particle dynamics; Free Vibrations of undamped Single Degree of Freedom system

COURSE OUTCOMES

On successful completion of teaching-learning and evaluation activities, a student would be able to

1. Apply basic laws of Mechanics for different types of force systems.
2. Apply the Laws of friction in engineering problems.
3. Apply the concept of equilibrium in statically determinate beams and trusses.
4. Determine the properties of areas for different shapes.
5. Apply the basics of Kinematics and Kinetics of particles in motion and undamped free vibration.

Text book:

1. R. C. Hibbeler, *Engineering Mechanics (Statics and Dynamics),* Pearson EducationAsia Pvt. Ltd
2. RS Khurmi and N Khurmi, A Textbook of Engineering Mechanics, S. Chand and Co. Ltd.
3. R. K. Rajput, Engineering Mechanics, Dhanpat Rai Publications (P) Limited
4. J. L. Meriam and L.G. Kraige, *Engineering Mechanics (Static & Dynamics),* JohnWiley

Reference books

1. F. P. Beer and E. R. Johnston, *Mechanics for Engineers (Static & Dynamics),*McGraw Hill
2. S. P. Timoshenko, D. H. Young, and J. V. Rao, *Engineering Mechanics,* Tata-McGraw Hill.

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Course Code: 3000003

Course Name: Environmental Engineering

L	T	P	Credit	Mode of Teaching	Mode of End Sem Exam
1	0	2	GRADE	Blended	MCQ (1.5 Hrs)

Course Objectives:

1. To create awareness about various sources of energy and their applications.
2. To create awareness about various environmental issues and how to deal with those environmental issues.
3. To impart fundamental concepts in environmental engineering dealing with air, water and waste management.
4. To create awareness about sustainability concepts and need of sustainable development for development of society.
5. To create awareness about various environmental policies.

Syllabus:

Unit 1: Energy: Various forms of Renewable and non-renewable energy and their applications, Solar Energy, Hydro, wind, biomass, geothermal, tidal and nuclear energy, green energy, clean energy, role of energy in economic and social development.

Unit 2: Water Environment: Ecosystems & its components, Water Cycle, Water availability & uses, Water resources problems and its solutions, Water pollution problems, Water quality characteristics & standards, Introduction to water treatment mechanisms.

Unit 3: Air Environment: Air pollution, causes, global effects, climate change and its impact, Introduction to air pollution control measures, Carbon credit, Carbon trading, Clean Development Mechanism (CDM).

Unit 4: Waste Management: Introduction to management of municipal solid waste, E-waste and plastic waste, various initiatives in management of waste.

Unit 5: Sustainability: Introduction to the concept of sustainability & sustainable development, Sustainable development goals, TBM, Challenges for sustainable development.

Policies: Multi1atcral environmental agreements and Protocols – Kyoto Protocol, Montreal Protocol, Indian policies - Environment Protection Act 1986, Waste Management rules 2000.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1. Explain the fundamental concepts of energy, ecosystems & environment.

CO 2. Recognize various environmental problems and their effects.

CO 3. Apply various air & water remediation methods.

CO 4. Apply waste management techniques.

CO 5. Apply the concepts of sustainability

Text Books:

1. D. K. Asthana, Meera Asthana, A Text Book of Environmental Studies, S Chand & Co., New Delhi.
2. P. Meenakshi, Elements of Environmental Science & Engineering, PHI, New Delhi

3. M.M. Sulphey, M.M. Safeer, Introduction to Environment Management, PHI, New Delhi
4. S K Dhameja, Environmental Engineering & Management, S K Kataria & Sons, new Delhi

Lab Work:

Basic Analysis of Water Quality Parameters: pH, Acidity, Alkalinity, Solids.

Skill Based Mini Project:

Students have to deliver a presentation in class preferably on power point and submit a write up of the same on following topics (preferably group project wherein students divided into group of 4):

1. Identification of potential water related problems in the vicinity of their residence and propose solutions for these problems.
2. Identification of potential air pollution issues in the vicinity of their residence and propose solutions for these problems.
3. Identify waste related issues in the vicinity of their residence and propose solutions for these issues.
4. Study of Solar Energy Panel in the Institute.
5. Study of Wind Mill in the Institute.

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Course Code: 2100020

Course Name: Basic Civil Engineering & Mechanics

L	T	P	Credit
3	0	0	3

Course Objectives:

1. To understand the utility of various types of building materials.
2. To understand the location, construction detail and suitability of various building elements.
3. To determine the location of object on ground surface.
4. To stabilize the position of various object.
5. To understand the effects of system of forces on rigid body in static conditions.
6. Analysis of determinate structure (beam & truss)

Syllabus:

Unit- I

Building Materials: Stones, bricks, cement, timber - types, properties, test & uses, Introduction of concrete properties & Laboratory tests on concrete, curing of concrete and mortar Materials.

Unit- II

Surveying & Positioning: Introduction to surveying, Survey stations, Measurement of distances-conventional and EDM methods, Measurement of directions by different methods, Measurement of elevations by different methods, reciprocal leveling.

Unit- III

Mapping & Sensing: Mapping details and contouring, Plane tables and related devices. Introduction of theodolite.Measurement of areas and volumes, application of measurements in quantity computations, Introduction of remote sensing and its applications.

Unit- IV

Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non-concurrent co-planner forces, free body Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses, method of joints, method of Sections. Frictional force in equilibrium problems.

Unit -V

Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment of Inertia of Composite section, Radius of Gyration, Introduction to product of Inertia and Principle Axes.

Support Reactions, Shear force and bending moment diagram for cantilever & simply supported beam with concentrated, distributed load and Couple.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Explain concepts and terminologies of building materials, surveying and mechanics.
CO 2: Apply various methods for surveying and mechanics.
CO 3: Determine the location, area and volume of objects on ground surface.

CO4: Solve the problems of surveying and mechanics by using various methods.
CO5: Analyse the effects of system of forces on rigid bodies in static conditions.

Text Books:

1. Surveying, Vol. – 1, Punmia B.C., Laxmi Publications, 17th edition, 2016
2. Building Material, B. C. Punmia, Laxmi Publications, 2016
3. A textbook of Engineering Mechanics, D. S. Kumar, Katsons Publications, 2013

Reference Books:

1. Basic Civil Engineering, S. Ramamrutam & R. Narayan, Dhanpat Rai Pub., 3rd edition, 2013
2. Applied Mechanics, Prasad I.B., Khanna Publication 17th edition, 1996
3. Surveying, Duggal, Tata McGraw Hill New Delhi, 4th edition, 2013
4. Engineering Mechanics - Statics &Dynamics, R.C. Hibbler, Pearson Publications, 14th edition, 2015
5. Engineering Mechanics - statics dynamics, A. Boresi & Schmidt, Cengage learning, 1st edition, 2008.
6. Applied Mechanics, R.K. Rajput, Laxmi Publications, 3rd edition, 2016

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Course Code: 2110221

Course Name: Surveying

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To understand the working of Theodolite, Tacheometer and Total Station.

2) To understand the determination of distances, direction and elevation.

3) To understand the surveying techniques and their application in various fields.

4) To provide knowledge on setting out civil engineering works & detailed field surveying.

5) To understand various types of curves used in practice and concepts of hydrographic & photographic surveying.

Syllabus:

Unit I: Surveying Measurements

Introduction to surveying, their classification, methods and principles, Measurement of distance and direction. Introduction to Remote Sensing & LiDAR technology in Survey, Global Positioning System (GPS) and its application.

Unit II: Levelling & Contouring

Method of levelling, methods of reduction of level, Reciprocal and trigonometric levelling, Contouring and Plotting, Use of Contour maps, Measurement of area and volume.

Unit III: Tachometry & Traversing

Principles and Instruments used in Tachometry, Methods of Theodolite traversing, Plotting and Adjustment, Omitted measurement in traverse, Plane Table Suverying.

Unit IV: Curves

Curve surveying, their use, elements of circular curves, Methods of setting out curves, obstacles and special problems, compound curves, reverse curves, transition curves, vertical curve, computation and setting out.

Unit V: Surveying Techniques

Systems and Principles of Triangulation, Baseline measurement and its extension, Total Station and its application in surveying, Introduction to Aerial Survey using UAV/ Drones, Introduction to photogrammetry and hydrographic survey.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Explain the techniques used for linear and angular measurements in surveying.

CO2: Explain the various concepts of levelling, contours and its application.

CO3: Apply various methods of surveying.

CO4: Analyse various techniques of controlling points.

CO5: Evaluate various methods for curve setting.

Text Books:

1. Surveying Vol. I, II, III, B.C. Punmia, Laxmi Publications New Delhi, 2016
2. Surveying Vol. I & II, K.R. Arora, Standard book House, New Delhi, 13th edition 2016
3. Surveying Volume – I & II, S. K. Duggal, McGraw Hill Publication, 2015

Reference Books:

1. Surveying theory & Practice, R.E. Devise, McGraw Hill, New York, 4th revised edition 2001
2. Fundamentals of surveying, S.K. Roy, Prentice Hall of India New Delhi, 2nd edition, 1999
3. Surveying & Levelling, N N Basak, McGraw Hill Publications, 2015
4. Plane & Geodetic surveying Vol. I & II, David Clark & J Clendinning, Constable & C. London, 2017

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Course Code: 2110223
Course Name: Survey Practice Lab

L	T	P	Credit
0	0	2	1

Syllabus:

List of Experiments:

1. Measurement of distance using chain & tape of given survey area.
2. Measurement of direction by prismatic compass & surveyor's compass.
3. Exercise of flying levelling by dumpy level.
4. Profile Levelling & Cross Sectioning of Road using dumpy level.
5. Determination of R.L. of a point whose base is accessible & inaccessible by Trigonometrical levelling.
6. Prepare Contour map by using Grid Pattern & Tachometric Method.
7. Preparation of contour map by total station.
8. Determination of horizontal & vertical position of a point by Total Station & measurement of area.
9. Traversing by Total Station.
10. Measurement of horizontal and vertical angle by Vernier Theodolite.
11. Determination of height & distance by using Stadia method & Tangential tachometry
12. Preparaton of mapr of given survey field by Radiation and intersection method using Plane table.
13. Resection by Two point problem & Three point problem.
14. Setting out of a simple circular curve by using Rankine's method.
15. Setting out of a simple circular curve by using Offset from the chord produced or deflection distance.
16. Measurement of base line by using Substance Bar.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Follow the guidelines for field surveying.
CO 2: Follow the working principles of survey instruments for measurements.
CO 3: Measure horizontal & vertical angle by theodolite for traversing and levelling.
CO 4: Determine tachometric constants for linear measurements by tachometry.
CO 5: Create a simple circular curve by using Rankine's method for alignment
CO 6: Develop contour map by using tachometer & total station.

Suggestive List of Skill Based Mini Project:

1. Development of contour map using Total Station.
2. Setting out of Horizontal Curve using Total Station & Theodolite.
3. Area Volume calculations using Total Station.

Text Books:

1. Surveying Vol. I, II, III, B.C. Punmia, Laxmi Publications New Delhi, 2016
2. Fundamentals of surveying, S.K. Roy, Prentice Hall of India New Delhi, 2nd edition, 1999

Reference Books:

1. Surveying theory & Practice, R.E. Devise, McGraw Hill, New York, 4th revised edition2001
2. Surveying Volume –II, S. K. Duggal, McGraw Hill Publication, 2015
3. Surveying Vol. I & II, K.R. Arora, Standard book House, New Delhi, 13th edition 2016

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Course Code: 2110222
Course Name: Strength of Materials

L	T	P	Credit
2	1	2	4

Course Objectives:

1) To understand the concepts of simple and compound stresses and strains.
2) To understand the behaviour of elastic materials in bending, shear and torsion.
3) To understand the stability behaviour of long columns under axial load.
4) To understand the power transmission by shift.
5) To understand stresses & strain developed in storage vessels
6) To calculate stresses / strain in statically indeterminate structures.

Syllabus:

Unit-I

Stress and Strains: Concept of Elastic body, stress and strain. Hooke's law various types of stress and strains. Elastic constants and their relation Stresses in compound bars, composite and tapering bars, temperature stresses.

Two-dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and strains. Mohr's circle of stresses. Strain energy and theories of failure.

Unit - II

Theory of simple bending: Concept of pure bending and bending stress, equation of bending, Neutral axis, Section-Modulus, Bending stress distribution across a section, Shear Stresses in Beams, beams of uniform strength, shear centre.

Unit-III

Torsion of Shafts: Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Hollow circular shafts. Combined bending and torsion.

Pressure Vessels: Thin cylinders and spheres. Stress due to internal pressure. Change in diameter and volumes.

Unit-IV

Columns and Struts: Euler's buckling load for uniform section, various end conditions. Slenderness Ratio.Merchant Ranking formulae, Eccentric loading on columns.

Unit-V

Deflection of statically determinate structure by Geometrical methods & Introduction of method of virtual work.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Apply the concepts of stress and strain.

CO 2: Apply theory of simple bending in beams.

CO 3: Apply the concept of pure torsion in shaft and determine the stresses in pressure vessels.

CO 4: Evaluate columns & struts with different end conditions.

CO 5: Analyse the structure using geometrical methods and virtual work to determine the deflection.

Text Books:

1. Strength of Materials, Sadhu Singh, Khanna Publishing, 1st edition 2016
2. Strength of Materials, S. Ramamrutham, R. Narayanan, Dhanpat Rai Publishing Company, 18th edition 2014
3. Strength of Materials, R. K. Bansal, Laxmi Publication; 6th edition 2018

Reference Books:

1. Strength of Materials, Timoshenko, Publisher CBS, 3rd edition 2004
2. Strength of Materials, HigdonStyle, Publisher Wiley, 3rd edition 1978
3. Strength of Materials Vol. I& II, B.C. Punmia, Laxmi Publication, 10th edition 2018
4. Mechanics of Materials, R.C. Hibbler, Pearson Publication, 2016
5. Mechanics of Materials, J. M. Gere & B.J. Goodno, Cengage Publisher, 8th edition 2014

List of Experiments:

1. Impact Test
2. Brinell Hardness Test
3. Behaviour of columns with Different End Conditions
4. Tensile test
5. Compression test
6. Flexure test
7. Shear test
8. Spring test
9. Torsion test
10. Verification of Maxwell's Reciprocal Theorem.
11. Bending of Beam (One Point loading only).
12. Bending of Beam (Two Point loading only).

Upon completion of practical course, the students will be able to:

CO1: Evaluate properties of material by impact test.

CO2: Evaluate properties of material by hardness test.

CO3: Evaluate properties of material by tensile test.

CO4: Determine compressive & flexural strength of materials.

Suggestive List of Skill Based Mini Project:

1. Determination of unsymmetrical bending & shear center.
2. Beam Deflection
3. Determination of Stress Strain curve for steel.

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SEMESTER-III

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Course Code: 2110321

Course Name: Fluid Mechanics - I

L	T	P	Credit
2	1	2	4

Course Objectives:

1) To understand fluid properties and concept of fluid continuum.
2) To understand the concepts of kinematics & dynamics of fluid flow.
3) To apply fluid flow principles to various fluid flow problems.
4) To understand the mechanism of fluid measurement.
5) To understand the method of simulation & dimensional analysis.
6) To understand the concepts of laminar flow.

Syllabus:

Unit I

Review of Fluid Properties: Engineering units of measurement, density, specific weight, specific volume, specific gravity, surface tension, capillary, viscosity, bulk modulus of elasticity, pressure and vapour pressure.

Fluid Statics: Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems – gravity dams and Tainter gates), buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Unit II

Kinematics of Flow: Types of flow-ideal & real, steady and unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streamlines, streamlines and stream tubes, continuity equation for one and three dimensional flow, rotational &irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flownets-their utility & method of drawing flownets.

Unit III

Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow, momentum equation, forces of fixed and moving vanes, velocity triangles.

Fluid Measurements: Velocity measurement, flow measurement (Orifices, nozzles, mouth pieces, orifice meter, Nozzle meter, venturimeter, weirs and notches).

Unit IV

Dimensional Analysis and Hydraulic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pie theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, etc.)

Unit V

Laminar Flow: Introduction to laminar, transition & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, stokes law, Bach wash processing, Instability of laminar flow to turbulent flow.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Define various fluid properties & states of fluid.
CO 2: Apply principles of fluid flow & dimensional analysis.
CO 3: Solve fluid flow problems.
CO 4: Analyze characteristics of fluid at rest, fluid at motion & dimensionless numbers.
CO 5: Discriminate different types of fluid flow, measurement techniques & principles.
CO 6: Apply the concepts of laminar flow in solving various fluid flow problems.

Text Books:

1. Fluid Mechanics, Modi & Seth, Standard Book House, Delhi, 21st edition, 2018.
2. Fluid mechanics, Girde & Mirazgaonkar, SCI Tech Publishers, 2019
3. Fluid Mechanics, R.K. Bansal, Laxmi Publishers, 2015

Reference Books:

1. Fluid Mechanics, A.K. Jain, Khanna Publishers, Delhi, 2014
2. Fluid Mechanics, Streeter, McGraw Hill Publishers, 9th edition, 2017

List of Experiments:

1. Determination of viscosity of fluid by redwood viscometer
2. Determination of metacentric height of floating body
3. Calibration of Venturimeter
4. Determination of Cc, Cd, Cv of Circular Orifice
5. Calibration of Mouthpiece
6. Calibration of Orifice Meter
7. Reynolds experiment for demonstration of stream lined & turbulent flow
8. Determination of Friction Factor for a pipe
9. Verification of Stoke's law.

Course Outcomes:

Upon completion of practical course, the students will be able to:

CO 1: Differentiate between different flow measurements devices.
CO 2: Notice flow through pipes & fall velocity of particle.
CO 3: Correct the instrumental errors.
CO 4: Apply Stoke's law to calculate terminal velocity.

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Course Code: 2110322

Course Name: Theory of Structure - I

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To develop an understanding of the behavior of structure under serviceability load.
2) To understand the mechanics of the material behavior of different type of structures.
3) To understand the concepts of analysis of indeterminate structures by various classical methods.
4) To make student aware of different methods of structural analysis.

Syllabus:

Unit-I

Deflection of beams: Energy Methods, Castigliano's theorem, method of real work, Principle of virtual work, method of virtual work for beam displacements.

Unit-II

Deflection of determinate trusses, Analysis of indeterminate trusses, Principle of least work.

Unit – III

Indeterminate Structures –I: Static and Kinematics indeterminacy, Analysis of Fixed and continuous beams by Theorem of three moments, Effect of sinking and rotation of supports**.**

Unit-IV

Indeterminate Structures – II**:** Analysis of beams and analysis of frames (with and without sway) by slope Deflection method.

Unit-V

Moment Distribution Method: Moment distribution method for analysis of beams and analysis of frames (without sway) Three hinged arches of different shapes, Eddy's Theorem. Two Hinged and Fixed Arches.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Classify different type of structures based on support conditions.
CO 2: Explain various methods & principles for analysis of structures.
CO 3: Apply various methods & principles for structural analysis.
CO 4: Analyse various structures using various methods, principles & theorems.
CO 5: Evaluate different methods of structural analysis.

Text Books:

1. Basic Structural Analysis, Reddy C. S., Tata McGraw Hill Publishing Company, 2017
2. Theory of Structures, S. Ramamrutham, R. Narayanan, Dhanpat Rai Publications, 9th edition, 2014
3. Theory of Structures, B.C. Punmia, Laxmi Publications, 2017

Reference Books:

1. Structural Analysis – A Unified classical and matrix Approach, Ghali A & Neville M, Chapman and Hall, New York, 6th edition, 2009

2. Intermediate structural analysis, Wang C.K., McGraw Hill, New York, 1984
3. Structural Analysis, Aslam Kassimali, C. L. Publisher, 2014
4. Structural Analysis, R. C. Hibbler, Pearson Publication, 2017

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Course Code: 2110323
Course Name: Geotechnical Engineering

L	T	P	Credit
2	1	2	4

Course Objectives:

1) The students will get the basic knowledge about natural material like rocks and get acquainted with natural dynamic processes and their actions.
2) The students will know the significance of geological investigations for civil engineering projects and site selection.
3) To inculcate the basic knowledge of soil such as its identification and classification, determination of various engineering properties and its suitability as a foundation/subgrade material.
4) To develop an understanding of the relationships between physical characteristics and mechanical properties of soils by experimentally measuring them.
5) To explain role of water in soil behavior and how soil stresses, permeability and quantity of seepage including flow net are estimated.
6) To determine shear parameters and stress changes in soil due to foundation loads & estimate the magnitude and time-rate of settlement due to consolidation.
7) To apply the principles of soil mechanics in stability analysis of slopes and settlement calculations.

Syllabus:

Unit-I Engineering geology & soil properties

Introduction to geology, mineralogy, petrology – Three-fold classification of rocks and their characteristic features. Structural geology - Types and classification of structures (Joints, Unconformities, Folds and faults) and their effect on civil engineering projects.

Introduction – Types of soils, their formation & deposition, basic definitions and relationships - Three phase system. Index properties of soil and their determination. Relationship between volume weight, void ratio-moisture content, moisture content-specific gravity, and unit weight- air voids etc.

Plasticity Characteristics of soil & indices and their determination, use of consistency limits, Classification of soil based on particle size and consistency limits, unified soil classification systems, Indian standard soil classification system, general characteristics of soil in different groups.

Unit-II Soil Water and Consolidation:

Permeability of soil: Darcy law and its validity, Determination of permeability in laboratory and in field using various methods like constant head method, pumping tests etc. factors affecting permeability of soil, Seepage analysis – introduction, stream & potential functions, flow nets, uses of a flow net, Introduction to effective, neutral and total stresses, effect of water table, fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.

Consolidation – Introduction, Compressibility and consolidation, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's Theory of consolidation, final settlement of soil deposits, Determination of consolidation settlement and secondary consolidation.

Unit-III Stress Distribution in Soils:

Stresses in soil – Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area, influence factors, isobars, Boussinesq's equation, westergaard's analysis. Newmark's influence chart. Contract pressure under rigid & flexible area, computation of displacements from elastic theory.

Unit – IV Shear Strength of Soils:

Mohr Circle and its characteristics, principal planes, relation between major and minor principal stresses. Mohr–Coulomb's theory, types of shear tests, direct shear test, merits of direct shear test, Triaxial compression test, test behaviour of UU, CU and CD tests, pore-pressure measurements, computation of effective shear strength parameters, unconfined compression test, vane shear test, critical void ratio, Liquefaction.

Unit – V Stability of Slopes:

Introduction, Types of slopes and their failure mechanisms, factor of safety, analysis of Infinite and finite slopes, wedge failure, Swedish circle method, friction circle method, stability numbers and charts. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Stability of Earth dams.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Evaluate different properties of rocks & soil and its classification.

CO2: Examine the flow and shear parameters & their effects on various types of soil.

CO3: Determine the stress distribution & shear failure by various methods.

CO4: Evaluate the shear strength parameter of soil by various methods.

CO5: Analyse the stability of slopes using various methods.

Text Books:

1. Soil Mech. & Found. Engg., Dr. K.R. Arora, Std. Publishers Delhi, 7th Edition, 2014
2. Soil Mech. & Foundation, Dr. B.C. Punmia, Laxmi Publications, Delhi, 16th Edition, 2017
3. Basic & Applied Soil Mechanics, Gopal Ranjan, New Age International Publishers, 2016
4. Parbin Singh., "Engineering and General Geology", S. K. Kataria and Sons, 2009

Reference Books:

1. Modern Geotech Engg. Dr. Aram Singh, IBT Publishers, Delhi, 8th Edition, 2016
2. Geotech Engg., C. Venkatramaiah, New Age International Publishers, 16th Edition, 2018
3. Soil Testing for Engg., T.W. Lambe, John Wiley & Sons. Inc. 1969
4. Bangar, K.M, Principles of Engineering Geology, Standard Publishers Distributors, 1995, New Delhi

List of Experiment's:

1. Moisture Content Determination. Oven Drying Method.
2. Grain Size Analysis – Mechanical Method.
3. Grain Size Analysis – Hydrometer Method.
4. Liquid Limit, Plastic Limit, Shrinkage Limit Tests.
5. In-Place Density tests – Core Cutter Method, Sand Replacement Method.
6. Specific Gravity Tests.
7. Permeability Tests, Variable Head Method.
8. Compaction Test.
9. Unconfined Compression Test.
10. Direct Shear Test.
11. Triaxial Shear Test (UU)
12. Vane Shear Test.
13. Plate Load Test (Demonstration)
14. Consolidation Test.

Upon completion of practical course, the students will be able to:

CO 1: Check physical properties of soil.

CO 2: Check strength properties of soil.

CO 3: Differentiate the flow properties and stresses of soil.

CO 4: Check shear strength of soil.

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Course Code: 2110324

Course Name: Transportation Engineering

L	T	P	Credit
2	1	2	4

Course Objectives:

1) To study the planning aspects of roads & highway.
2) To study the geometric design aspects of highway and road.
3) To know about pavement material and design.
4) To understand the construction process and methods of roads & highway.
5) To study about traffic characteristics and design of intersections.

Syllabus:

Unit – I Highway Development and Planning

Highway Development in India — Necessity for Highway Planning – Different Road Development Plans; Classification of Roads. Road Network Patterns — Highway Alignment- Factors affecting Alignment- Engineering Surveys.

Unit – II Highway Geometric Design

Importance of Geometric Design – Design controls and Criteria – Highway Cross Section Elements – Sight Distance Elements – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance – Design of Horizontal Alignment – Design of Super elevation and Extra widening – Design of Transition Curves – Design of Vertical alignment - Gradients- Vertical curves.

Unit – III Traffic Studies

Spot Speed Studies and Volume Studies, Speed and Delay Studies purpose, causes of delay, methods of conducting speed and delay studies, Origin and destination Studies (O & D): Various methods, collection and interpretation of data, Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service, Parking Studies: Methods of parking studies, design of intersections at grade & grade separated.

Unit -IV

Highway Construction Materials: Aggregates and their types, physical and engineering properties, Fillers, Bitumen, Characteristics, Emulsions and cutbacks, Basic tests on all materials.

Design of Flexible & Rigid Pavements: Introduction, flexible pavement, factors affecting design and performance, stress in flexible pavement, design of flexible pavement as per IRC, rigid pavements – components & functions, factors affecting design & performance of CC pavements, stress in rigid pavement, type of joints, dowel bar, tie bar and its functionalities.

Unit – V Evaluation and Maintenance of Pavements

Pavement distress in flexible and rigid pavements, Pavement evaluation, structural evaluation, evaluation by deflection measurements, Strengthening of pavements, Types of maintenance, Importance of highway drainage, Surface and sub-surface drainage arrangements.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Explain the principles of highway planning & their geometrical design.

CO 2: Evaluate physical properties of suitable highway engineering materials with drainage provisions.

CO 3: Apply the concepts of traffic engineering in transportation planning.

CO 4: Design pavements as per regulations.

CO 5: Formulate the layers of pavement along with provisions of its drainage & maintenance.

Text Books:

1. Highway Engineering, S.K. Khanna & C.E.G. Justo, Nemchand Pub., 10th edition, 2018
2. Highway Engineering, Gurucharan Singh, Standard Publishers, 5th edition, 2006
3. Principles & Practices of Highway Engineering, L R Kadiyali, N B Lal, Khanna Publishers, 2016

Reference Books:

1. Principles of Pavement Design, E.J. Yoder & M.W. Witzech, Wiley India, 2nd edition, 2011
2. Highway Engineering, O' Flaherty, Butterworth-Heinemann, 4th edition, 2002
3. Principles of Practice of Highway Engg., Sharma & Sharma, Asia Publishing House, 1965
4. Analysis and Design of Pavements, Haung, Pearson, 2nd edition, 2004

List of Experiments:

1. Aggregate Crushing Value Test
2. Determination of Aggregate Impact Value
3. Determination of Los Angeles Abrasion Value
4. Determination of flakiness index and elongation index of aggregates.
5. Determination of California Bearing Ratio Value
6. Determination of Penetration Value of Bitumen
7. Determination of Viscosity of Bituminous Material
8. Determination of Softening Point of Bituminous Material
9. Determination of Ductility of the Bitumen
10. Determination of Flash Point and Fire Point of Bituminous Material
11. Determination of Bitumen Content by Centrifuge Extractor
12. Determination of Stripping Value of Road Aggregate
13. Determination of Marshall Stability Value for Bitumen.

Course Outcomes:

Upon completion of the practical course, the students will be able to:

CO 1: Select suitable aggregate material by testing the physical properties.

CO 2: Determine properties of bitumen and its grade.

CO 3: Determine CBR value of material for subgrade and subsequent layers of pavement.

CO 4: Design job mix formula for bituminous surface using Marshal Stability test

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Course Code: 2110325

Course Name: Self Learning / Presentation

L	T	P	Credit
0	0	2	1

Course Objectives:

1) To encourage students to read, study & understand different topics of civil engineering published in articles, literatures.
2) To help in presenting different topics of civil engineering and related subjects to supplement theoretical knowledge gained in class.
3) To make student acquire good oral & written communication skills.
4) To promote the habit of lifelong learning.
5) To prepare students develop adequate soft skills to be able to present their topic effectively to listeners.

Syllabus:

1. Any relevant topic related to civil engineering from within or beyond the syllabus through Swayam / NPTEL /MOOC.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Analyze contemporary issues in civil engineering & its allied areas through literature survey.
CO2: Distinguish state of art & relevance of the topic in national & international arena.
CO3: Demonstrate good oral & written communication skills.
CO4: Develop poster and power point presentations for effective communication.
CO5: Display lifelong learning.

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Course Code: 2110326

Course Name: Summer Internship Project - I

L	T	P	Credit
0	0	4	2

Course Objectives:

1) To encourage students to read, study & understand different topics of civil engineering
2) To make student acquire good oral & written communication skills.
3) To promote the habit of lifelong learning.

Syllabus:

Each candidate shall have to undergo 15 days in-house summer internship at the institute after the completion of their 2nd Semester exams (in summer vacations). Candidate can choose from various modules which are offered by the institute and after successful completion of internship they have to submit detailed report.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Observe various activities in field.
CO2: Examine the utility of general and specific equipments for construction.
CO3: Differentiate the construction projects individually and in team.
CO4: Develop the writing and communication skills for various engineering problems.
CO5: Adapt lifelong learning for benefit of society.

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Course Code: 1000005

Course Name: Project Management and Financing

L	T	P	Credit
2	0	0	GRADE

Course Objectives:

1) To know about project, its attributes and essentials of project planning
2) To develop the project network
3) To take rational decisions using project networks for successful completion of the projects
4) To decide about about rational utilization of resources in project.
5) To have an elementary idea of finances involved in a project and managing it

Unit I:

Project Planning:

Introduction to Project Management, Difference between Project and Production, Attributes of a Project: Time, Cost, Quality and Safety. Stakeholders of a Project, Project life cycle. Project Planning: Types of Project Plans and feasibility.

Unit-II:

Project Network logic: Project Networking and work flows, Activity duration and methods of estimating activity duration – One time estimate three time estimates, Duration estimation procedure. Use of Bar Charts, Mile stone charts and networks, Network representation schemes: Activity on Arrow and Activity on Node Networks (A-o-A & A-o-N), Logic behind developing project network and simple network calculations, Critical paths and floats.

Unit-III:

Decision making through networks: CPM, PERT & PDM:

Use of network in Decision Making: Importance of critical path, Monitoring the progress and updating the project plan. Use of floats in Resource smoothening, Introduction to Precedence Diagramming Method (PDM), Different lag and lead relations in terms of SS(Start to Start), SF(Start to Finish), Finish to Start(FS), and Finish to Finish(FF) and composite relations.

Unit-IV:

Project Cost Control: Breakeven analysis in planning stage, Direct and indirect cost, slope of direct cost curve, Total project cost and optimum duration, contracting the network for cost optimization. Escalation & Variation in prices.

Unit-V:

Projects Financing:

Introduction to project financing; Role of governments in financing projects, Funder and Concessionaire: Economic multiplier effects of Projects; Means of financing-public finance and private finance, Granting authority: World Bank Group, IMF,ADB, Micro and Small Enterprises Funding Scheme (MSME), Elementary understanding of Procurement of infrastructure projects through Public Private Partnership (PPP) route, Build Operate Transfer (BOT), Build Operate Own & Transfer (BOOT); Stakeholders' perspectives, Lifecycle of PPP projects, Micro & Macro economics concepts and its application in Project Financing.

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Course Outcomes

Upon completion of the course, the students will be able to:

CO 1: Know the attributes of project and its different phases.

CO 2: Develop the project network based on work breakdown structure and esimation of activity durations

CO 3: Analyze the project network and make **decide** the various alternates.

CO 4: Evaluate the optimum cost of project for assigned deadlines.

CO 5: Understand the different options to arrange the finances to complete it within stipulated time

Recommended Text-Books:

1. Project Management Scheduling PERT and CPM by Dr. B.C. Punmia, K.K. Khandelawal
2. PERT & CPM Principles and Applications by L.S. Srinath, Affiliated EWP Pvt. Ltd.
3. Project Planning and Control by Albert Lester, Fourth Edition Elsevier Butterworth-Heinemann.

Recommended Reference Books:

1. A Management Guide to PERT/CPM With GERT/PDM/DCPM and Other networks by Jerome D. Wiest, Ferdinand K. Levy, Prentice Hall.
2. Project Management with CPM and PERT by Joseph J . Moder, Cecil R . Phillips, VanNostrand Reinhold Company

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SEMESTER-IV

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Course Code: 2110421
Course Name: Fluid Mechanics – II

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To develop an understanding of fluid flows patterns and learn to use boundary layer theory and drag.
2) To apply theories of laminar & turbulent flow to solve typical pipe flow problems in the field.
3) To apply boundary layer theory to estimate drag &lift for various shapes of the objects.
4) To classify the types of flows in open channel and also to design open channel sections in a most economical fashion with minimum wetted perimeter and learn about critical flows.
5) To study about non uniform flows in open channel and longitudinal slopes in open channel and also to learn about the characteristics of hydraulic jump.
6) To understand design philosophy of various types of pumps & turbines.

Syllabus:

Unit-I

Turbulent Flow: Laminar and turbulent boundary layers and laminar sub layer, hydro dynamically rough boundaries, velocity distribution in turbulent flow, Resistance of smooth and artificially roughened pipes, Commercial pipes, aging of pipes.

Pipe Flow Problems: Losses due to sudden expansion and contraction, losses in pipe fittings and valves, Concepts of equivalent length, Hydraulic and energy gradient lines, Siphon, Pipes in series, in parallel, Branching of pipes.(Hardy Cross method)

Pipe Network: Water hammer (only quick closure case) transmission of power.

Unit - II Forces on immersed bodies:

Introduction, Force Exerted by a flowing fluid on a stationary body, Expression for Drag & Lift, Drag on a sphere, Terminal velocity of a Body, Drag on a cylinder. Introduction to Development of Lift on a Circular Cylinder and an Airfoil

Unit – III Uniform Flow in open Channels:

Channel geometry and elements of channel section, Velocity distribution, Energy in open channel flow, Specific energy, Types of flow, Critical flow and its computations, Uniform flow and its computations, Chezy's and Manning's formulae, Determination of normal depth and velocity, Normal and critical slopes, Economical sections.

Unit - IV Gradually varied flow

Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow-hydraulic jump in rectangular channels and its basic characteristics, Surges in open channels.

Unit - V Introduction to Fluid Machinery: Turbines & Pumps

Turbines: Classifications, definitions, Similarity laws, Specific speed and unit quantities, Pelton turbine – their construction and settings, Speed regulation, Dimensions of various elements. Action of jet, Torque, Power and efficiency for ideal case, Characteristics curves. Reaction turbines construction & setting, Draft tube theory, Runaway speed, Simple theory of design and characteristic curves, Cavitation.

Pumps: Principle of working & criteria for selection of different types of pump, viz. Centrifugal, Reciprocating.

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Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Differentiate different types of fluid flow & fluid machinery.

CO 2: Describe principles of analysis of fluid flow problem.

CO 3: Explain basic principles for measurement of different forces acting on fluid body.

CO 4: Analyze pipe flow, open channel flow problems & various characteristics of hydraulic machines.

CO 5: Design open & closed conduit systems.

Text Books:

1. Fluid Mechanics, Modi & Seth, Standard Book house, Delhi, 21st edition, 2017
2. Open Chanel Flow, K. Subramanya, Tata McGraw Hill, New Delhi, 5th edition, 2019

Reference Books:

1. Open Channel Flow, Rangaraju, Tata Mc Graw Hill Publishing Comp. Ltd., New Delhi, 1stedition,2001
2. Fluid Mechanics, A.K. Jain, Khanna Publishers, Delhi,1988
3. Fluid Mechanics, Hydraulics & Hydraulic Mechanics, K.R. Arora, Standard Publishers, 2009
4. Open Channel Hydraulics, Chow V.T., McGraw Hill, New York, 57th edition, 2009

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Course Code: 2110422

Course Name: Theory of Structure - II

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To understand the analytical procedure related to the analysis of building frame by some classical methods viz. Kani's methods and approximate methods of analysis.
2) To study the multi storey frames subjected to gravity loads and lateral loads
3) To understand matrix method and its application for computer based analysis of structure.
4) To understand the influence line concepts for indeterminate structures
5) To develop the skill to deals with the problems of moving loads in the structures & their analysis techniques.
6) To understand the concepts of plastic analysis of structures.

Syllabus:

Unit – I

Moment distribution method in analysis of frames with sway, Analysis of box frames, analysis of beams and frames by Kani's methods.

Unit – II

Analysis of tall frames, Calculation of various loads including wind and earthquake loads, Introduction to Code provisions for lateral loads. Approximate analysis of multistorey frames for vertical and lateral loads.

Unit – III

Matrix Method of Structural Analysis: Force method and displacement method.

Unit-IV

Rolling Load and Influence Lines

Maximum SF & BM curves for various types of Rolling loads, EUDL, Influence Lines for determinate structural beams, Trusses, Three Hinged Arches.

Unit-V

Plastic analysis of beams & frames

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Explain various methods for analysis of structures and frames.
CO 2: Analyse various loads on framed structures using codal provisions.
CO 3: Analyse different type of structures for various load conditions by different methods.
CO 4: Draw influence line diagrams for statically determinate & indeterminate structure.
CO 5: Analyse beams & frames using plastic analysis.

Text Books:

1. Intermediate structural analysis, Wang C.K., McGraw Hill, New York, 1984
2. Basic Structural Analysis, Reddy C. S., Tata McGraw Hill Publishing Company, 2017
3. Theory of Structures, S. Ramamrutham, R. Narayanan, Dhanpat Rai Publications, 9thedition, 2014

Reference Books:

1. Elementary Structural Analysis, Norris C.H., Wilbur J.B. McGraw Hill Intenrational
2. Structural Analysis, Aslam Kassimali, C. L. Publisher, 2014
3. Structural Analysis, R. C. Hibbler, Pearson Publication, 2017
4. Indeterminate Structural Analysis, Kinney Sterling J., Addison Wesley
5. Matrix Methods of Framed Structures, Weaver W & Gere J. M., CBS Publishers, Delhi

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Course Code: 2110423

Course Name: Water Supply Engineering

L	T	P	Credit
2	1	2	4

Course Objectives:

1) The structure of drinking water supply systems, including water transport, treatment and distribution.
2) Water quantity and water quality criteria and standards, and their relation to public health.
3) Operation and maintenance of water supply system components.
4) How to estimate water requirement of a city
5) How to design water treatment plant for urban & rural areas
6) How to design water distribution network including pipe & appurtenances.

Syllabus:

Unit-I

Water demand (types variation, factors affecting it), Design period, population forecasting methods, estimation of water requirement of cities, Sources of Water, Source selection, underground water quality & quantity, characteristics of water (laboratory method & effects), water borne diseases, standards for drinking water.

Unit-II

Water treatment flow diagram, design, construction, working of (Aerators, screens, plain sedimentation tank, tube settlers), coagulants & coagulation, flocculation, feeding and mixing of coagulants, optimum dose of coagulants, design & working of clarrifloculator, filtration (Theory & types), Design, operation & construction of slow sands & Rapid sand gravity filters, pressure filters.

Unit-III

Disinfectants (types) & disinfection method of disinfection, chlorine & chlorine compounds, types of chlorination, Hardness (Causes & types), various methods of softening, Recarbonation, calculation of chemical requirements, Removal of colour, odor, Taste, Iron & manganese, algae removal, fluoridation / defluoridation, desalination, latest treatment techniques.

Unit-IV

Intake structures (location, types & design), conduits for transporting water, forces on conduits, types of pressure pipe, joints, corrosion of pipe (causes & control), pipe appurtenances (design), pumping of water (numerical problems), types of pumps, Economical diameter of rising main (numerical), pumping stations.

Unit-V

Requirement of good distribution system, layout of distribution, methods of distribution, Distribution reservoir and calculation of its capacity, fixing size of pipe, Analysis of pipe networks (Hardy cross method, Equivalent pipe method), appurtenances used in distribution networks, water supply & plumping system in building, Rural water supply.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Explain the concepts of water supply engineering.

CO 2: Determine the requirements for safe supply of water.

CO 3: Apply suitable water treatment technique based upon the available data.

CO 4: Analyse a given water supply scheme.

CO 5: Design a water supply system based upon the needs of society.

Text Books:

1. Water Supply Engg., B. C. Punmia, Laxmi Publication (P) Ltd. New Delhi, 2016
2. Water Supply Engg., S. K. Garg, Khanna Publishers New Delhi, 2017

Reference Books:

1. Water Supply & Sanitary Engg., G.S. Birdie, Dhanpat Rai Publishing Company, 2014
2. Water & Waste Water Technology, Mark J Hammer, Prentice Hall of India, 6th edition, 2008
3. Environmental Engineering, Peavy, Rowe & Tchobanoglous, McGraw Hill Publication, 2017
4. Manual of Water Supply and Treatment by CPHEEO, GOI, 2009

List of Experiments:

1. Determination of pH of a given water sample.
2. Determination of Total Solids, Dissolved Solids and Suspended Solids of water sample.
3. Determination of Chloride concentration in water sample.
4. Determination of turbidity of water sample using turbidity meter.
5. Determination of acidity of the water sample.
6. Determination of alkalinity of the water sample.
7. Determination of Hardness of the water sample.
8. Determination of D.O concentration of a given water sample.
9. Determination of optimum dose of coagulants required for the treatment of a given water sample.
10. Determination of MPN of the given water sample.
11. Determination of Sulphate of a given water sample.
12. Determination of Nitrate of a given water sample.

List of Skill Based Mini Project

1. Estimation of drinking water requirement for various locations including new upcoming localities in and around Gwalior city.
2. Design of water supply & distribution layout system for various new upcoming localities in and around Gwalior city.
3. Study of existing water supply & distribution scheme available for Gwalior city and suggest improvement in it.
4. Study of existing water supply sources and determination of water quality of those sources.
5. Determination of water quality characteristics of various localities in and around Gwalior city.
6. Draw a water quality map for various localities in and around Gwalior city.

7. Comparative analysis of water quality between Municipal Corporation supplied water in city & R.O. treated water.
8. Study of new water treatment plant in the city.
9. Design of water treatment system for new upcoming localities in and around Gwalior city.
10. Performance evaluation of existing water treatment plants in city.

Upon completion of the course, the students will be able to:

CO 1: Follow sampling procedure & other guidelines for sampling & analysis of water samples.

CO 2: Check various water quality parameters.

CO 3: Improve the water quality by suggesting suitable corrective measures.

CO 4: Train others on various ways of improving the quality of water.

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Course Code: 2110424
Course Name: Water Resources Engineering

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To understand the water requirements of various types of crops.
2) To understand the different types of irrigation systems.
3) To plan the reservoir systems as per the requirements.
4) To understand the concepts of Khosla's and Bligh's theory & its applications.
5) To understand the concepts of Lacey's and Kennedy theory for design of canal systems.
6) To develop an understanding of various components of hydrological cycle, their behaviors & factors affecting it & solve problems on measurement on rainfall, infiltration, evaporation.
7) To understand concepts of Hydrometry & ground water hydrology.
8) To discuss the importance of estimation of runoff, analysis of rainfall data and various hydrographs and analyze various problems off runoff using various hydrograph theories.
9) To develop an understanding of various methods of flood estimation in general & flood frequency.

Syllabus:

Unit – I

Hydrology: Definition, Hydrological Cycle, Precipitation, Evaporation, Infiltration, Runoff, Estimation of Runoff, Empirical Formulae, Rainfall-Runoff relationships, Hydrometry, Methods of Stream Gauging, Rating Curves, Ground Water: Elements of Ground water Hydrology, Well Hydraulics, Equations of Ground Water flow, Solutions and applications.

Unit - II

Hydrographs & Hyetographs, Hydrographs analysis, Unit Hydrographs, Methods of constructing, Unit Hydrographs, S-curve Hydrograph, Synthetic unit Hydrograph, Flood and its estimation by different methods.

Unit-III Irrigation Water Requirement and Soil Water Crop Relationship:

Irrigation, Definition, Necessity, Advantages and disadvantages, Type and methods, Irrigation development.

Soil: Types and their occurrence, Suitability for irrigation purposes, Wilting, Coefficient and field capacity, Optimum water supply, Consumptive use and its determination. Irrigation methods - surface and subsurface, Sprinkler and drip irrigation.

Duty of water, factors affecting duty and methods to improve duty, Suitability of water for irrigation, Crops and crop seasons, Principal crops and their water requirement, Crop ratio and crop rotation, Intensity of irrigation, Water logging-causes, effects & its prevention.

Unit – IV Reservoir Planning and Canal Irrigation

Types of reservoir, Reservoir planning, Estimation of storage capacity by mass curve analyses, Economical height of dam, Reservoir sedimentation, Canal systems, Planning and layout of canal systems, Regime concept and tractive force method of channel design, Channel losses, Design of unlined and lined canals, Kennedy's and Lacey's silt theories, Typical canal section, Water- logging: Causes and effects, Remedial measures, Salinity, Land reclamation and Drainage.

Unit – V Diversion works and Canal Regulation Structures

Elements of diversion works, Type of weirs and barrages, Weir design for surface and sub-surface flow, Bligh's, Lane's and Khosla's theories, Silt excluders and Silt ejectors.
Canal regulation structure like Head & Cross regulations, falls, Escapes, Outlets, Their Need, Functions sketches.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Explain the concept of hydrology and hydrograph
CO 2: Apply basic principles for measurement & forecasting of rainfall & runoff.
CO 3: Analyse runoff hydrograph by various methods.
CO 4: Analyse various requirements for an efficient irrigation project.
CO 5: Design different components of irrigation system using different theories.
CO 6: Plan an efficient, economical & safe irrigation system.

Text Books:

1. Engineering. Hydrology, K. Subramanya, Tata McGraw Hill Publ. Co. 4th edition, 2013
2. Hydrology & Water Resources Engineering, S. K. Garg, Khanna Publishers, 2016
3. Irrigation Engineering & Hydraulic Structures, Santosh Kumar Garg, Khanna Publishers, 2017
4. Irrigation, Water Power & Water Resources Engg., K.R. Arora, Standard Publishers Distributors, 2010

Reference Books:

1. Engineering. Hydrology, J. NEMEC, Prentice Hall, 1972
2. Hydrology for Engineers, Linsley, Kohler, Paulnus, Tata Mc Graw Hill, 2014
3. Engineering Hydrology, H. M. Raghunath, New Age International Publishers, 5th edition, 2015.
4. Irrigation, Water Resources & Water Power, Dr. P.N. Modi, Standard Book House, 9th edition, 2014
5. Irrigation Engineering by Varshney & Gupta, Vol I & II, Nemchand Publishers, 2007.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous Institute Affiliated to R.G.P.V., Bhopal MP)
NAAC Accredited with A++ Grade

Course Code: 2110425
Course Name: Civil Drawing Lab

L	T	P	Credit
0	0	2	1

Course Objectives:

1) To draw plan, elevation & section of various components of a building.
2) To prepare sketches of various components of building like doors, windows etc.
3) To expose students to use software's like AutoCAD in civil engineering drawing.

Syllabus:

List of Experiments:

1. One drawing sheet containing Foundations and Footing using AutoCAD
2. One drawing sheet containing Doors, Windows, Ventilators using AutoCAD
3. One drawing sheet containing Lintels, Trusses and Arches etc. using AutoCAD
4. One drawing sheet containing detailed planning of one room residential building
5. One drawing sheet containing detailed planning of multi rooms residential building
6. Drawing sheets one each of residential building using AutoCAD
7. One Drawing sheet of Institutional building using AutoCAD
8. One Drawing sheet of Commercial building using AutoCAD
9. One Drawing sheet of Hospital building using AutoCAD
10. Sketches of various building components i.e. floors, roof & roof covering
11. Sketches of various building components i.e. staircase

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Attempt to draw different components of a building.

CO2: Produce plan, elevation & section of various components of a residential and institutional building.

CO3: Use AutoCAD software in civil engineering drawing.

CO4: Prepare drawing sheets of various types of buildings like residential, institutional, commercial etc

ANNEXURE – VI

SYLLABUS FOR COURSES TO BE OFFERRED IN V SEMESTER (2022-2023 ADMITTED BATCH)

Course Code: 2110511

Course Name: Waste Water Engineering

L	T	P	Credit
2	1	0	3

Course Objective:

To provide comprehensive knowledge on sewerage systems, sewage composition, disposal standards, and various sewage treatment techniques, including advanced processes.

Syllabus:

Unit – I

Sewerage schemes & sewerage system and their importance, collection & conveyance of sewage, Estimation of sewage & storm water quantity, fluctuation in sewage flow, Flow through sewer, Design of sewer, Construction & maintenance of sewer, testing of sewer, Sewer appurtenances.

Unit – II

Characteristics and analysis of wastewater (Physical, chemical & biological parameters). Oxygen demand i.e. BOD & COD, TOC, TOD, ThOD, relative Stability, Population equivalent, Natural methods of waste water disposal i.e. by land treatment & by dilution, Self-purification capacity of stream, Oxygen sag analysis (numerical problems).

Unit-III

Unit operations for waste water treatment, Preliminary treatment such as screens, grit chamber, floatation tank, sedimentation etc. and chemical clarification, Role of micro-organism in biological treatment, Sewage filtration – theory & design. Trickling filter its design & constructions, modifications in trickling filter.

Unit-IV

Methods of Biological Treatment (Theory & Design) – Activated Sludge Process, Oxidation ditch, Stabilization Ponds, Aerated Lagoon, Anaerobic Lagoons, Septic Tank & Imhoff tank, Rotating Biological contactor Sources & treatment of sludge, sludge thickening and digestion, sludge drying beds, sludge disposal.

Unit-V

Advanced Waste Water treatment – Need of advanced treatment, Diatomaceous earth filters, Ultra filtration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Sewage treatment plants using MBBR and SBR technology**.**

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Explain the concepts of waste water engineering.

CO 2: Determine the requirements for safe disposal of sewage.

CO 3: Apply suitable techniques for sewage treatment & disposal based upon the available data.

CO 4: Analyse a given sewerage system.

CO 5: Design sewage system for safe disposal of sewage

Text Books:

1. Waste Water Engg., B. C. Punmia, Laxmi Publication (P) Ltd. New Delhi, 2016
2. Sewage Disposal and Air Pollution Engineering, S. K. Garg, Khanna Publishers, 2017

Reference Books:

1. Water Supply & Sanitary Engg., G.S. Birdie, Dhanpat Rai Publishing Company,2014
2. Environmental Engg., Rowe, Peavy & Tchobanogolous Tata McGraw Hill Publication,2017
3. Water & Waste Water Technology, Mark J Hammer, Prentice Hall of India, 6th edition 2008
4. Waste Water Engineering, Metcalf & Eddy, Mc Graw Hill Book Company New Delhi, 4th edition 2005
5. CPHEEO Manual on Sewage & Sewage Treatment System, GOI, 2013

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2					2	2	2				2	2	1
CO2	2	2		2		3	3	2				2	3	2
CO3	2	2		3		3	3					2	2	2
CO4	3	3	2	3	2	3	3		1	2		3	3	2
CO5	3	3	3	2	2	3	3	2	1	2		3	3	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 2110512
Course Name: Estimating Costing & Contracting

L	T	P	Credit
2	1	0	3

Course Objective:

To develop skills to calculate quantities for various civil works such as buildings and culverts, compute earthwork, understand detailed specifications and perform rate analysis, learn different estimation methods, comprehend valuation processes and rent fixation, and grasp contracting procedures.

Syllabus:

Unit I Introduction of Estimating:

Purpose and importance of estimates, principles of estimating, methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet, bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

Unit II: Details of Items:

Specifications of materials and works: Types of Specifications, General specifications for Class A, B & C type of building, Detailed specifications of important items of work.

Rate Analysis: Task for average artisan, various factors involved in the rate of item, material and labour requirement for various trades, preparation for rates of important items of work, current schedule of rates (C.S.R)

Unit III: Estimates

Preparing detailed estimates of various types of buildings, R.C.C Works, Culverts, earth work calculations for roads and Canals, contingencies and work charge establishment, use of computational tools for preparing estimates.

Unit IV: Valuation

Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate of interest, methods of valuation, rent fixation of buildings

Unit V: Contracting

Contract, Types of engineering contract, essentials documents of engineering Contract, Conditions of contract, Earnest Money Deposit, Security Deposit, Responsibility of Engineer, Contractor & Client.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Explain the fundamentals of quantity estimation, costing & contracting.

CO 2: Apply methods to estimate area, volume & cost.

CO 3: Evaluate mathematical & numerical models for rate & quantity estimation.

CO 4: Determine rates & value.

CO 5: Classify different rates of items, contracts & measurement techniques.

Text Books:

1. Estimating & costing in civil engineering, B.N. Dutta, UBS Publishers, 28th revised edition 2016
2. Estimating & Costing, S.C. Rangwala, Charotar Publishing House, 17thedition 2017

Reference Books:

1. Estimating & Costing for Civil Engg., G.S. Birdie, Dhanpat Rai Publications, 6thedition 2014
2. Estimating & Costing specification & valuation in civil engineering, M. Chakraborti, 2006

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2			1		2	1	2			3	1		2
CO2	2			1	1	2	1	2			3	2		2
CO3	2	2		2	2	2	2	2	2	2	3	3		3
CO4	2	3		2	1	2	2		2	2	3	3		3
CO5	2	3	1	2	2	2	2	2	2	2	3	3		3

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 2110513

Course Name: Structural Design & Drawing (RCC)

L	T	P	Credit
2	1	0	3

Course Objective:

To understand various design philosophies; learn design of RC elements such as beams, slabs, columns, footings and staircase using Indian Standard provisions.

Syllabus:

Unit-I

Design principles: Materials; Introduction to IS 456; Design philosophies: Working stress, Ultimate load and Limit state design

Singly reinforced beam sections: Analysis and design of singly reinforced rectangular beams: Lintel, Cantilever, Simply supported beams; Design for deflection.

Unit-II Design of Beams:

Design for Shear; Design for bond; Doubly-reinforced and Flanged sections; Design of Continuous beams

Unit-III Design of Slabs:

Slabs spanning in one direction: Cantilever, Simply supported and Continuous slabs; Slabs spanning in two directions; Circular slabs.

Unit-IV Columns & Footing:

Design of short columns subjected to axial loads, axial load and bending moments (section with no tension); Design of long columns; Introduction to IS 13920; Design of isolated and combined footings.

Unit-V Staircases:

Design of Staircases with waist slab: straight flight, dog legged, and open well staircase with different support conditions; Design of Tread-riser (without waist slab) staircase.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Apply the concepts of different design philosophies for analysis and design of singly reinforced concrete beams using relevant IS Codes.

CO2: Analyze and design singly, doubly and flanged sections for flexure, shear and bond using relevant IS Codes

CO3: Design one way, two way and circular slabs using relevant IS Codes.

CO4: Analyze and design compression members and design footings using relevant IS codes.

CO5: **Design** different type of staircase using relevant IS codes

Text Books:

1. Reinforced Concrete Limit State Design, A.K. Jain, Nem Chand Pub.,7th edition, 2012
2. Reinforced Concrete, Pillai & Menon, Tata McGraw Hill, New Delhi, 3rd edition,2017
3. Limit State Design, P.C. Varghese, Prentice Hall of India, New Delhi, 2nd edition,2008
4. RCC Design, Neelam Sharma, Katson Publishers, 2014

Reference Books:

1. Reinforced Cement Concrete, P. Dayaratnam, Medtech Publishers, 5th edition, 2017.
2. Reinforced Concrete Design, S.N. Sinha, Tata McGraw Hill, 3rd edition, 2017
3. Plain and Reinforced Concrete, O.P. Jain and Jai Krishna, Nem Chand Pub.,8th edition, 2008
4. Reinforced Cement Concrete, Winter & Nelson, McGraw Hill, 11th edition, 1991

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	2		2				2	3	1
CO2	3	3	2	2	1	2		2				2	3	1
CO3	3	3	2	2	2	2		2	1	2		3	3	2
CO4	3	3	3	2	2	2		3	1	2		3	3	2
CO5	3	3	3	2	2	2	2	3	1	2		3	3	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 2110514
Course Name: Railway, Airport & Tunnel Engineering

L	T	P	Credit
3	0	0	3

Course Objective:

To expose the students to Railway survey, planning & requirements of geometrical elements for ideal railway track, design, construction and maintenance, and planning, design principles & construction methodology of Airports and Tunnel.

Syllabus:

Unit-I Introduction to Railway Engineering

Tractive resistance & Permanent way, Principles of Transportation, Transportation by Road, Railways, Airways, Waterways, their importance and limitations. Route surveys and alignment, railway track, development and gauges. Hauling capacity and tractive effort.

(i) Rails- types, welding of rails, wear & tear of rails, rail creep ultrasonic Testing of Rails.
(ii) Rail fastenings- types – Fishplates, spikes bearing plates, chairs, keys, check and guard rails, Elastic Rail Clips (ERC), Vossloh fastening.
(iii) Sleepers, types & comparison, requirement of a good sleeper, sleeper density, Turnouts.
(iv) Ballast –Requirement of good ballast, various materials used as ballast, quantity of ballast, Ballast Cleaning.

Different methods of plate laying, material trains, calculation of materials required, relaying of track.

Unit-II

Track alignment, Geometrical Design, Gradient & gray compensation, Super Elevation, Equilibrium, Cant and Cant deficiency, relationship of super elevation, gauge, speed & radius of curves, speed on curves, Limits of super elevation, Cant deficiency, Negative super elevation, curves , transition curves, necessity of points and crossing. Turnouts, Points of switches, Types of switches, crossing, calculation of turnouts, sleepers at points &crossing, Types of Track junctions. Types, locations, general equipments, layouts, marshalling yards. Definition, layout details, designs of simple turnouts.

Stations and Yards: Site selection for a Railway stations, Requirements of railway stations, junction station &terminals, location, layout & details, Types of signals in stations and yards, principles of signaling and inter-locking, Modern development in railways, Modernization of track for high speed, Maintenance of track, Track drainage.

Unit – III Airport Planning, Runway & Taxiway

Airport site selection. air craft characteristic and their effects on runway alignments, wind rose diagrams, basic runway length and corrections, classification of airports. Geometrical elements: taxi ways and runways, pattern of runway capacity.

Unit – IV Airport, Obstructions, Lightning & Traffic control

Zoning regulations, approach area, approach surface-imaginary, conical, horizontal. Rotating beacon, boundary lights, approach lights, runway and taxiway lighting etc. instrumental landing system, precision approach radar.

Unit-V Tunnels

Selection of route, Engineering surveys, alignment, shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts , Construction of tunnels in soft soil, hard soil and

rock, Different types of lining, methods of lining, Mucking operation, Drainage and ventilation, Examples of existing important tunnels in India and abroad**.**

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Explain various elements of railway tracks, signaling , yards, bridges & tunnels.
CO 2: Illustrate various gauges, signals, fasteners, turnouts, crossing & their deffects etc.
CO 3: Explain the elements of airport planning, & tunnels.
CO 4: Design runway & taxiway system as per regulations.
CO 5: Apply construction methods of railway tunnels.

Text Books:

1. Airport Planning & Design, S. K. Khanna & M. G. Arora, Nem chand Publishers, 6th edition, 1999
2. Railway Engineering, Arora & Saxena, Dhanpat Rai & Sons, 2010

Reference Books:

1. Airport Planning, Froesch, Charles, Andesite Press, 2017
2. The Planning & Design of Airports, Horonjeff Robert, MHE, 5th edition, 2010
3. Railway Engineering, S.C. Rangwala, Charotar Publication House, Anand, 2012
4. Railway Tack, K.F. Antia, New Book Company, 5th edition, 1960

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		1			1	1					1		1
CO2	2			1		1	1					2		1
CO3	2	2	1	2		2	2	2				2	3	2
CO4	2			2	2	2	2					2		2
CO5	2	1		2	2	2	2	2	2	2	2	2		2

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 2110515
Course Name: Minor Project – I

L	T	P	Credit
0	0	4	2

Course Objective:

To familiarize students with a thorough understanding and practical experience in addressing civil engineering problems, utilizing both conventional methods and software, innovating and implementing technological solutions, functioning professionally with social responsibility, collaborating effectively with peers, and preparing professional reports with proficient data presentation and computer graphics skills.

Syllabus:

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

OR

Shall submit a detailed report of experimental work / software package on any specific problem of importance.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Recognize various engineering problems and techniques to solve them.
CO 2: Reproduce the solution of the problems upon the need of society.
CO 3: Cooperate to work within group.
CO 4: Develop the writing and communication skills for various engineering problems.
CO 5: Display lifelong learning.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3	2	2	2	2	3	3	1	3		2
CO2	3	3	3	3	3	3	3		3	3	3	3	3	2
CO3				2	2				3	2		2		
CO4									3	3		2		
CO5	2	2	2	2	2	2	2	2	2	2	1	3	2	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 2110516
Course Name: Self Learning / Presentation

L	T	P	Credit
0	0	2	1

Course Objective:

To encourage students to read and understand various civil engineering topics from articles and literature, present these topics to supplement classroom knowledge, develop strong oral and written communication skills, promote lifelong learning, and cultivate soft skills for effective presentations.

Syllabus:

1. Any relevant topic related to civil engineering from within or beyond the syllabus through Swayam / NPTEL/MOOC.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Analyze contemporary issues in civil engineering & its allied areas through literature survey.
CO 2: Distinguish state of art & relevance of the topic in national & international arena.
CO 3: Demonstrate good oral & written communication skills.
CO 4: Develop poster and power point presentations for effective communication.
CO 5: Display lifelong learning.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1		2	1	2	2	1	2	2	1	2	1	2
CO2	1			2	1	2	2	1	2	2	1	2		1
CO3									3	3		2		
CO4									3	3		2		
CO5	2	2	2	2	2	2	2	2	2	2	1	3	2	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 2110517
Course Name: Summer Internship Project – II

L	T	P	Credit
0	0	4	2

Course Objective:

To develop students' oral and written communication skills, promote lifelong learning, and cultivate soft skills for effective topic presentations to listeners.

Syllabus:

Each candidate shall have to undergo 15 days in house summer internship related to soft skills at the institute after the completion of their 4th Semester exams (in summer vacations) and after successful completion of internship they have to submit detailed report.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Develop the writing and communication skills for various engineering problems.

CO 2: Adapt lifelong learning for benefit of society.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									3	3		2		
CO2	2	2	2	2	2	2	2	2	2	2	1	3	2	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 2110520
Course Name: Data Science

L	T	P	Credit
3	0	2	4

COURSE OBJECTIVE:

The objective of a data science course is to equip students with the skills to analyze and interpret complex data sets using statistical and computational techniques. This includes learning to extract actionable insights, build predictive models, and communicate findings effectively.

Syllabus

Unit 1

Need for data science, benefits and uses, facets of data, data science process, Introduction of basics python tool, Setting working Directory, Creating and saving a script file, File execution, removing variables from environment, clearing environment, Commenting script files, Variable creation, Data types and associated operations, Arithmetic and logical operators.

Unit 2

Control structures, loop, Functions**,** data structures: Lists, Arrays, Tuples, Dictionary, Sets, NumPy library, Data Collection: Getting to know your data, Types of Data, Data collection strategies, Data Pre-processing, Feature engineering, Exploratory Data Analytics.

Unit 3

Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis, inferential statistics: hypothesis testing, probability: probability theory, conditional probability, Pandas library, dataframe and dataframe related operations, Reading files.

Unit 4

Data Cleaning and Preparation, Handling Missing Data, Data Transformations using pandas and sklearn library, Removing Duplicates, Replacing Values, Detecting Outliers. Data visualization on different dataset using matplotlib and seaborn libraries, Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot.

Unit 5

Supervised learning: Regression, classification, Linear regression, logistic regression, decision tree, tree creation with entropy and information gain, ID3 algorithm, random forest, naïve bayes theorem, K-nearest neighbor and ensemble methods for solving real world problems, Unsupervised learning: Clustering, Reinforcement learning.

BOOKS AND REFERENCES

1. Mastering python for data science, Samir Madhavan
2. Introduction to linear algebra - by Gilbert Strang
3. Applied statistics and probability for engineers – by Douglas Montgomery
4. Pattern Recognition and Machine Learning, Christopher M. Bishop

COURSE OUTCOMES:

After completing the course, the student will be able to:

CO1: define different Data Science techniques.
CO2: illustrate various tools used for Data Science technique.
CO3: apply data visualization techniques to solve real world problems.
CO4: build exploratory data analysis for Data Science methods.
CO5: apply Data Science techniques for solving real world problems.
CO6. **Evaluate** the performance of algorithms in data science.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2		1	1	1						2		
CO2	2	2		1	1	1						2		
CO3	2	2		2	2	1						2		
CO4	2	2		2	2	1						2		
CO5	2	2	1	2	2	1						2		
CO6	2	2		2	2	1						2		

1 - Slightly; 2 - Moderately; 3 – Substantially

List of Experiments

1. Perform creation, indexing, slicing, concatenation and repetition operations on Python built – in data types: Strings, List, tuples, dictionary, set
2. Solve problems using decision and looping statements.
3. Apply python built-in data types: Strings, List, tuples, dictionary, set and their methods to solve any given problem.
4. Handle numerical operations using math and random number functions
5. Maniulation of NumPy arrays – Indexing, Slicing, Reshaping, Joining and Splitting.
6. Computation on NumPy arrays using universal functions and mathematical methods.
7. Import a CSV file and perform various statistical and comparison operations on rows/columns.
8. Create Pandas series and data-frame from various inputs.
9. Import any CSV file to Pandas data-frame and perform the following –
    - Visualize the first and last 10 records
    - Get the shape, index and column details
    - Select / Delete the rows / columns based on conditions
    - Perform ranking and sorting operations
    - Do required statistical operations on given columns
    - Find the count and uniqueness of the given categorical values
    - Rename single / multiple files
10. Import any CSV file to Pandas data-frame and perform the following –
    - Handle missing data by detecting and dropping / filling missing values.
    - Transform data using different methods
    - Detect and filter outliers
    - Perform vectorized string operations on Pandas series
    - Visualize data using line plots, bar pots, histograms, density plots and scatter plots
11. Use the scikit-learn package in python to implement the regression model and its related methods

List of Skill Based Mini Project:

1. Write a python Program to predictive maintenance of Infrastructure.
2. Write a python Program for Traffic Flow Optimization.
3. Implement python programming for Water Distribution System Optimization.\

4. Implementation of Decision Tree method for Environmental Impact Assessment
5. Write a Program for Material Quality Prediction using MLR.
6. Write a python Program for Structural Health Monitoring.
7. Implement python programming for Sewer Distribution System Optimization.

Course Code: 1000006

Course Name: Disaster Management

L	T	P
2	-	-

Course Objective:

To understand the basic concepts, definitions, and terminologies in disaster management, the types and categories of disasters, the challenges posed by disasters, and the key skills needed to manage their impact.

Syllabus:

Unit 1: Introduction to disaster management, concepts and definitions: disaster, vulnerability, risk severity, frequency and details, capacity impact, prevention, mitigation.

Unit 2: Disasters – Disasters classification, demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends, hazard and vulnerability profile of India.

Unit 3: Disaster Impacts – Disaster impact (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues, impact of natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides etc.), impact of manmade disasters (industrial pollution, artificial flooding in urban areas, urban disasters, transportation accidents etc.).

Unit 4: Disaster Risk Reduction (DRR)- Disaster management cycle- its phases; prevention, mitigation, preparedness, relief and recovery; structural and non- structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response. Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders: Policies and legislation for disaster management. DRR programmes in India and the activities of National Disaster Management Authority.

Unit 5: Disasters, Environment and Development – Factors affecting vulnerability such as impact of development projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Course Outcomes:

After successful completion of the course, the students will be able to

CO1: Identify disaster prevention and mitigation approaches.
CO2: Classify global and national disasters, their trends and profiles.
CO3: Determine the impacts of various disasters.
CO4: Apply Disaster Risk Reduction in management.
CO5: Infer the linkage between disasters, environment and development.

Text Books:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

3. Srivastava H.H. & Gupta G.D., Management of Natural Disasters in developing countries, DayaPublishers Delhi, 2006.

Reference Books:

1. http://ndma.gov.in (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in / (National Disaster Management in India)
3. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
4. National Disaster Management Policy, 2009, GOI.
5. Inter Agency Standing Committee (IASC) (Feb. 2007), IASC Guidelines on Mental Health andPsychosocial Support in Emergency Setting. Geneva: IASC

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1				1	1					2		1
CO2	2	1		2		1						2		2
CO3	2	2		3	2	2	2	2	2	3		2		2
CO4	2	1		2	2	2	2	2	2	2	2	2		2
CO5	2			2		3	2	2			1	2	3	2

1 - Slightly; 2 - Moderately; 3 – Substantially

ANNEXURE – II
SYLLABUS FOR COURSES TO BE OFFERRED IN VI SEMESTER

Course Code: 2110621
Course Name: Solid & Hazardous Waste Management

L	T	P	Credit
3	0	0	3

Course Objective:

To provide students with the knowledge and skills to manage solid, hazardous, and special waste types, focusing on collection, processing, and disposal, while exploring sustainable practices involved in management of waste.

SYLLABUS

Unit I Introduction:

Introduction to waste and waste management, classification of solid waste, objective of solid waste management, Issues related to solid waste, elements of waste management system. Solid waste sources – Nature and characteristics (physical, chemical & biological) – Quantities and Qualities – Generation rates. Overview of MSW Rule 2016 and implementation of SBM and smart waste management solutions in the country.

Unit II

Collection, storage and disposal of waste:

Implementation of 5R policy in waste management. On-site handling, storage and processing of waste. Collection of waste: collection systems and its analysis, collection vehicles, vehicle routing, route balancing, Transfer station, transportation of wastes. Disposal of waste through landfills – types of landfills, planning & operation of landfills, leachate management & control of gases in landfills, environmental monitoring of landfills.

Unit III

Processing and energy recovery form waste:

Conveying and compacting waste, shredding, material separation, recycling of waste: examples/case study. Biological processing of waste involving composting, Vermicomposting and biomethanation. Concept of Refused derived fuel. Thermal processing of municipal solid waste involving incineration, pyrolysis, gasification.

Unit IV

Hazardous Waste Management:

Introduction to hazardous waste: Definition, types, characterization and composition, source, health effects. Storage and transportation of hazardous waste, labeling of hazardous waste, Physical, Chemical and Biological treatment of hazardous waste, bioremediation of hazardous waste and disposal of waste. Overview of hazardous waste management rules.

Unit V

Other wastes and their management:

Biomedical waste management – sources, types and classification of biomedical wastes, health effects, challenges in waste management and biomedical waste management practices.

E-waste management – sources, types and classification of e-wastes, effects, challenges in waste management and handling of E-waste.

Plastic waste management – types of plastics, sources of plastic waste, impacts of plastic waste, plastic waste management practices.

Course Outcomes:

Upon completion of the course the student will be able to:

CO 1: Explain the principles & concepts of waste management

CO 2: **Apply** various techniques of handling the waste.

CO 3: **Apply** various techniques of processing and energy recovery from waste.

CO 4: **Apply** various techniques to manage hazardous waste.

CO 5: **Analyze** the challenges and impacts of managing biomedical, e-waste, and plastic waste

Text Books:

1. Text Book of Solid Wastes Management, Iqbal H. Khan and Naved Ahsan, CBS Publishers, 1st edition 2012

2. Integrated Solid Waste Management, Hilary Theisen and Samuel A, Vigil, George Tchobanoglous, McGraw Hill Yew York, 1993

Reference Books:

1. Environmental Engineering, Rowe, Peavy & Tchobanogolous, Tata McGraw Hill Publications, 2017

2. CPHEEO, Manual on Municipal Solid Waste management, Central Public Health and Environmental Engineering organization, Government of India, New Delhi, 2016

3. Solid Waste Engineering, Vesilind P.A., Worrel H. W. and Reinhard, Thomson Learning Inc, 2003

4. Charles A. Wentz, Hazardous Waste Management, McGraw Hill, New York. 1995.

5. David Rimbers, Municipal Solid Waste Management: Pollution Technologies Review, Noyes Data Corporation, London, 1990.

6. Michael D. Lagrega, Philip L. Buckingham, Jeffrey C. Evans. Hazardous Waste Management, McGraw Hill, New York. 1994.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	2	2	-	-	-	1	2	2	-
CO2	2	-	2	-	-	2	3	-	-	-	2	3	3	-
CO3	2	-	2	-	-	2	3	-	-	-	2	3	3	-
CO4	2	-	-	-	-	2	2	-	-	-	2	2	-	-
CO5	2	-	-	-	-	2	3	-	-	-	2	2	-	-

1 - Slightly; 2 - Moderately; 3 – Substantial

Course Code: 2110622
Course Name: Structural Design & Drawing (Steel)

L	T	P	Credit
3	1	0	4

Course Objectives:

To comprehensively study the design principles and behavior of steel structural components as per IS 800-2007, including the analysis and design of compression, tension, and flexural members, bolted and welded connections, plate girders, column bases, and both laterally restrained & unrestrained beams and Introduction to plate girders & composite construction, while understanding their performance under gravity loads and using simple and built-up sections.

Syllabus:

Unit-I

Structural properties of steel, Design of structural connections – Bolted and Welded connections, Codal provision.

Unit-II

Design of Tension members. Lug angles & Tension splices. Codal provision.

Unit-III

Design of Compression member - simple and compound, Lacings & Battens. Codal provision.

Unit-IV

Design of Laterally supported and unsupported beams, web buckling and crippling. Codal provision.

Unit-V

Design of bases for steel columns, Introduction to plate girder, Introduction to composite construction. Codal provision.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Design the steel connections using relevant IS codes.
CO 2: Design tension members using relevant IS codes.
CO 3: Design simple and built up compression member using relevant IS codes.
CO 4: Design flexural members using relevant IS codes.
CO 5: Design column bases and explain plate girders and composite construction.

Text Books:

1. Limit State Design of Steel Structures, S. K. Duggal, McGraw Hill Publication, 3rd edition, 2017

Reference Books:

1. Design of Steel Structures, S. S. Bhavikatti, International Publishing House, 2014
2. Design of Steel Structures, N. Subramanian, Oxford University Press India, 2008

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1	2	2	3	1	2		3	3	2
CO2	3	3	3	2	1	2	2	3	1	2		3	3	2
CO3	3	3	3	2	2	2	2	3	1	2		3	3	2
CO4	3	3	3	2	2	2	2	3	1	2		3	3	2
CO5	3	3	3	2	2	2	2	2	1	2		3	3	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 2110623
Course Name: Minor Project - II

L	T	P	Credit
0	0	4	2

Course Objectives:

To prepare students to address real-life civil engineering challenges through innovative problem-solving and the application of conventional and software-based methods, while fostering professional expertise, social responsibility, teamwork, leadership, and effective communication. Additionally, students will develop skills in technological innovation, system implementation, professional reporting, data presentation, and the use of computer tools and graphics for engineering solutions.

Syllabus:

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

OR

Shall submit a detailed report of experimental work / software package on any specific problem of importance.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Recognize various engineering problems and techniques to solve them.
CO 2: Reproduce the solution of the problems upon the need of society.
CO 3: Cooperate to work within group.
CO 4: Develop the writing and communication skills for various engineering problems.
CO 5: Display lifelong learning.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3	2	2	2	2	3	3	1	3		2
CO2	3	3	3	3	3	3	3		3	3	3	3	3	2
CO3				2	2				3	2		2		
CO4									3	3		2		
CO5	2	2	2	2	2	2	2	2	2	2	1	3	2	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 2110620
Course Name: Artificial Intelligence & Machine Learning

L	T	P	Credit
3	0	2	4

COURSE OBJECTIVES:

To equip students with fundamental knowledge of Artificial Intelligence, Neural Networks, and Machine Learning, including basic representation, reasoning paradigms, and the operational techniques used in these fields.

Unit – I:

Introducing Artificial Intelligence: Definition, Goals of AI, Task of AI, Computation, Psychology and Cognitive Science. Perception, Understanding, and Action. Artificial intelligence vs machine learning vs deep learning and other related fields. Applications of Artificial intelligence and Machine Learning in the real world.

Unit – II:

Problem, Problem Space and Search:

Production System, Blind Search: BFS & DFS, Heuristic Search, Hill Climbing, Best First Search

Introduction to Neural Networks:

History, Biological Neuron, Artificial Neural Network, Neural Network Architectures, Classification, & Clustering

Unit – III:

Introduction to Machine Learning: Traditional Programming vs Machine learning. Key Elements of Machine Learning: Representation, process (Data Collection, Data Preparation, Model selection, Model Training, Model Evaluation and Prediction), Evaluation and Optimization. Types of Learning: Supervised, Unsupervised and reinforcement learning. Regression vs classification problems.

Unit – IV:

Supervised Machine Learning: Linear regression: implementation, applications & performance parameters. Decision tree classifier, terminology, classification vs regression trees, tree creation with Gini index and information gain, IDE3 algorithms, applications and performance parameters. Random forest classifier. Case study on regression and classification for solving real world problems.

Unit – V:

Unsupervised Machine Learning: Introduction, types: Partitioning, density based, DBSCAN, distribution model-based, hierarchical, Agglomerative and Divisive, Common Distance measures, K-means clustering algorithm. Case study on clustering for solving real world problems.

RECOMMENDED BOOKS:

1. Artificial Intelligence: A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
2. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
3. Introduction to AI & Expert System: Dan W. Patterson, PHI.
4. Pattern Recognition and Machine Learning, Christopher M. Bishop
5. Introduction to Machine Learning using Python: Sarah Guido
6. Machine Learning in Action: Peter Harrington

COURSE OUTCOMES: After completing the course, the student will be able to:

CO1: Define basic concepts of Artificial Intelligence & Machine Learning.
CO2: Illustrate various techniques for search and processing.
CO3: Identify various types of machine learning problems and techniques.
CO4: Analysis various techniques in Artificial Intelligence, ANN & Machine Learning.
CO5: Apply AI and ML techniques to solve real world problems.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	1	1	1	-	-	-	-	-	2	-	-
CO2	2	2	-	1	1	1	-	-	-	-	-	2	-	-
CO3	2	2	-	2	2	1	-	-	-	-	-	2	-	-
CO4	2	2	-	2	2	1	-	-	-	-	-	2	-	-
CO5	2	2	-	2	2	1	-	-	-	-	-	2	-	-

1 - Slightly; 2 - Moderately; 3 – Substantially

List of experiments of AIML

1. Predicting Concrete Strength Using Machine Learning
2. Predicting Soil Bearing Capacity
3. Construction Project Risk Prediction
4. Material Waste Prediction in Construction
5. Optimal Site Selection for Construction Projects Using ML
6. Predicting Construction Material Performance Using Machine Learning
7. Machine Learning for Seismic Risk Assessment
8. Estimating Construction Project Costs with Regression Models
9. Smart Building Energy Optimization
10. Water quality data analysis using machine learning

List of Skill Based Mini Projects:

1. Write a program to predict compressive strength using a dataset with concrete mixture details and strength values to predict the. Evaluate the model using metrics like Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE).

2. Write a program to predict future congestion levels using past traffic data (volume, speed, weather, time). Use regression models like Random Forest or XGBoost for prediction.

3. Write a program to predict energy usage using historical data on temperature, humidity, and occupancy. The goal is to minimize energy consumption by predicting usage patterns and optimizing HVAC systems.

4. Develop a classification model to predict the condition of pavement (e.g., good, fair, poor) using features

like traffic load, weather conditions, and maintenance logs.

5. Develop a model that can predict material costs for future projects, helping in cost estimation and planning using historical cost data to.

6. Use historical geotechnical data to train a regression model that can predict the soil's bearing capacity for different building types.

7. Implement anomaly detection algorithms (e.g., Isolation Forest or auto encoders) on vibration data to identify structural defects such as cracks, deformation, or fatigue.

8. Implement a classification model that determines the suitability of land for construction projects (e.g., residential, commercial) based on geotechnical parameters.

Course Code: 1000007
Course Name: Intellectual Property Rights

L	T	P	Credit
2	0	0	Grade

COURSE OBJECTIVE:

To acquaint learners with the fundamental concepts of Intellectual Property Rights (IPR), develop their expertise in IPR-related issues, and sensitize them to emerging challenges and the rationale behind IPR protection.

Syllabus

UNIT I: Introduction: Introduction to IPRs, Basic concepts and need for Intellectual Property – Meaning and practical aspects of Patents, Copyrights, Geographical Indications, IPR in India and Abroad. Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II: Intellectual Property Rights: The IPR tool kit, Patents, the patenting process, Patent cooperation treaties: International Treaties and conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

Unit III: Fire & Explosion: Intellectual Property Protections: IPR of Living Species, protecting inventions in biotechnology, protections of traditional knowledge, biopiracy and documenting traditional knowledge, Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection. Case studies: The basmati rice issue, revocations of turmeric patent, revocation of neem patent.

Unit IV: Exercising and Enforcing of Intellectual Property Rights: Rights of an IPR owner, licensing agreements, criteria for patent infringement. Case studies of patent infringement, IPR – a contract, unfair competitions and control, provisions in TRIPs.

Unit 5: Role of Patents in Product Development: Commercialization, Recent changes in IPR laws impacting patents and copy rights, intellectual cooperation in the science and allied industry. Patentable and non-patentable research. Case studies

Reference Books:

1. P.B. Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy. Tata Mc Graw Hill, 2001.
2. Steve Smith, The Quality Revolution.1st ed., Jaico Publishing House, 2002.
3. Kompal Bansal and Praishit Bansal. Fundamentals of IPR for Engineers, 1st Edition, BS Publications, 2012.
4. Prabhuddha Ganguli. Intellectual Property Rights. 1st Edition, TMH, 2012.
5. R Radha Krishnan & S Balasubramanian. Intellectual Property Rights. 1st Edition, Excel Books, 2012.

6. M Ashok Kumar & Mohd. Iqbal Ali. Intellectual Property Rights. 2nd Edition, Serial Publications, 2011.
7. Vinod V. Scople, Managing Intellectual Property. Prentice Hall of India PvtLtd, 2012.
8. Deborah E. Bouchoux. Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets. Cengage Learning, 3rd ed. Edition, 2012.
9. Prabuddha Ganguli. Intellectual Property Rights: Unleashing the Knowledge Economy. McGraw Hill Education, 2011. Edited by Derek Bosworth and Elizabeth Webster.

Course Outcomes:

At the end of this course, the student will be able to

CO1. Imbibe the knowledge of Intellectual Property and its protection through various laws

CO2. Apply the knowledge of IPR for professional development

CO3. Develop a platform for protection and compliance of Intellectual Property Rights & knowledge CO4. Create awareness amidst academia and industry of IPR and Copyright compliance

CO5. Deliver the purpose and function of IPR and patenting.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	1	1	1	-	-	-	-	-	2	-	-
CO2	2	2	-	1	1	1	-	-	-	-	-	2	-	-
CO3	2	2	-	2	2	1	-	-	-	-	-	2	-	-
CO4	2	2	-	2	2	1	-	-	-	-	-	2	-	-
CO5	2	2	-	2	2	1	-	-	-	-	-	2	-	-

1 - Slightly; 2 - Moderately; 3 – Substantially

ANNEXURE – III

(Syllabus 6th Sem B.Tech Civil Engineering (2022 Admitted Batch))

ANNEXURE – III

SYLLABUS FOR OPEN CATEGORY COURSES (OCs) TO BE OFFERRED IN VI SEMESTER

Course Code: 910111
Course Name: Building Services & Maintenance

L	T	P	Credit
3	0	0	3

Course Objectives:

To gain knowledge and understanding of essential building services, including fire-fighting systems, water management, and lift planning and maintenance in high-rise buildings, and to develop skills for the effective maintenance and management of these services.

Syllabus:

Unit I

Introduction: Introduction to primary services in a building, Type of services required to keep facility usable, planning of services. Organization structures of services management. Role and administrative functions of supervisors. Outline of the concept of carbon trading and self sustainable zero carbon building. Importance

Unit II

Fire Fighting: Standard fire, fire resistance, classification of buildings. Basic requirement of the works for fighting system, various components of the fire fighting system. Maintenance required of the system, fire fighting in high-rise buildings, commercial/industrial complexes. Public buildings, checklist for fire safety. Provision of NBC.

Unit III

Lifts/Elevators, Escalators: Legal formalities for elevators, various types of lifts, working mechanisms of lift and escalators. Indian standard codes for planning & installations of elevator, inspection & maintenance of lifts.

Unit IV

Plumbing Services Water Supply System: Basics of Plumbing systems. Requirement of Plumbing works, Agency, Activity flow chart for plumbing work. Quality checking of materials. Water supply and distribution system is high-rise building & other complexes, pumps and pumping mechanisms. Operation & maintenance of fittings & fixtures of water supply & sanitary. Do’s & Don’ts for water pipe networks.

Unit V:

Maintenance and management of services: Telecommunication network, computer network LAN, Electrical network & appliances. Basics of single phase & three phase electrification, precautions and safety measures during electrification. Indian standard codes for electrical appliances & wiring operations & maintenance of network & appliances. Landscaping & Horticulture. Building maintenance management, applications of computer in service management. Flowcharts of air conditioning & heating.

Centralised systems, monitoring and working of the equipments, Checklist of inspection, Performance testing. Water proofing. Damp proofing & Termite proofing. Working procedure & stages of work of water proofing for W.C., Bathrooms, Terrace, sloping roof, Basements, tanks. Use of chemicals for water proofing treatment.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Identify various services required in a building.

CO2: **Carry** out planning of fire fighting system for a building.

CO3: Develop a management strategy for maintenance of building services in a building.

CO4: **Design** a sustainable building services plan for a building.

Reference Books:

1. Building services Design and Management by Jakie Partman, Willey Blackwell 2014.

2. Building Services Engineering by David V .Chadderton, Routledge 2013.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	1	1	-	-	-	-	-	1	-	1
CO2	2	2	2	2	1	1	-	-	-	-	-	2	-	1
CO3	3	3	3	3	3	2	1	-	-	-	-	2	-	2
CO4	3	3	3	3	2	2	-	-	-	-	-	2	-	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 910110
Course Name: Sustainable Materials & Green Buildings

L	T	P	Credit
3	0	0	3

Course Objectives:

To equip students with a comprehensive understanding of sustainability in the context of building materials and construction practices, including the use of low-carbon cements, advanced brick kilns, and recycled aggregates to reduce natural resource consumption. The course emphasizes indoor air quality through the study of VOCs and explores concepts of embodied, operational, and life cycle energy while promoting energy efficiency through optimal design and Building-Integrated Photovoltaics (BIPV). Additionally, students will gain awareness of sustainability standards and certifications such as ECBC, LEED, and GRIHA.

Syllabus:

Unit-I

Embodied energy, Operational energy in Building and Life cycle energy. Ecological foot print, Bio-capacity and calculation of planet equivalent.

Unit-II

Role of Material: Carbon from Cement, alternative cements and cementitious material, Alternative fuel for cements for reduction in carbon emission. Sustainability issues for concrete. Role of quality, minimization of natural resource utilization, High volume fly ash concrete, geo-polymer concrete etc. concrete with alternative material for sustainability.

Unit-III

Reduction in water consumption in concrete, Recycled aggregate, Energy for grinding crushing of cement aggregate etc. and reduction. Operational energy in building role of materials and thermal conductivity. Clay Bricks, Types kilns, Comparative energy performance emission performance and financial performance, Indoor air quality.

Unit-IV

Paints, Adhesive and sealants for use in building, Volatile organic content (VOC) emission issues and indoor air quality for Sustainability and Health hazard. Operational energy reduction and net zero building, Optimization for design of building for energy efficiency and example of optimization through use of Evolutionary genetic algorithm.

Unit-V

Radiation budget, Surface water balance, Effects of trees and microclimatic modification through greening, Use of Building Integrated Photo Voltaic (BIPV) and other renewable energy in buildings, basic concepts and efficiency. Energy codes ECBC requirement, Concepts of OTTV etc, Green Performance rating, requirements of LEED, GRIHA.

Course Outcomes

Upon completion of the course, the students will be able to:

CO1: Apply the concepts of sustainability in the context of building and conventional engineered building materials.

CO2: Explain the Concepts of VOC and indoor air quality.

CO3: Apply the concepts of embodied, Operational and Life Cycle Energy, Minimizing Energy consumption by optimal design, use of BIPV.

CO4: Apply the guidelines of ECBC, LEED, GRIHA while planning a building.

CO5: Use renewable energy sources in buildings.

Text Book:

1. Sustainable Construction: Green Building Design and Delivery, John wiley & sons, 2005.

2. Building Reuse: Sustainability, Preservation, and the Value of Design by Kathryn Rogers Merlino, University of Washington Press, 2018.

Reference Books:

1. Natural Design, Organic Architecture: Lessons for Building Green by Frank Lloyd Wright, Rizzoli; Illustrated edition

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	2	3	-	-	-	1	3	3	-
CO2	3	2	2	1	-	2	3	-	-	-	1	3	3	-
CO3	3	2	2	1	-	2	3	-	-	-	1	3	3	-
CO4	3	2	2	1	-	2	3	-	-	-	1	3	3	-
CO5	3	2	2	1	-	2	3	-	-	-	1	3	3	-

1 - Slightly; 2 - Moderately; 3 – Substantially

ANNEXURE–II

SYLLABUS/ EXPERIMENT LIST FOR DEPARTMENTAL LABORATORY COURSES (DLC) TO BE OFFERRED IN VII SEMESTER

Course Code: 2110711

Course Name: Software Application for Solving Civil Engineering Problems

L	T	P	Credit
0	0	2	1

Course Objective:
To practice various software used in civil engineering design and analysis, including SciLAB, QGIS, and other relevant applications in civil engineering works.

List of Experiments:

1. Design and analysis of reinforced concrete beam using suitable civil engineering software tools.
2. Design and analysis of reinforced concrete slab using suitable civil engineering software tools.
3. Design SciLAB code to develop load-response curve for different load conditions for a beam designed of experiment1.
4. Settlement analysis of a shallow foundation using MS Excel: Calculate immediate settlement for a cohesive soil layer by inputting load, foundation dimensions, and soil properties, and plot a load-settlement curve.
5. Application of QGIS in preparation of vector map of major city and preparation of land use and land cover maps.
6. Determination of critical network for a construction project using suitable civil engineering software tools.
7. To prepare an estimation of Multi-storey building and Road using MS-Excel.
8. Design water supply networks through Hardy Cross method. (Loops, EPANET and other software's).
9. Slope stability analysis using MS Excel: Perform a simplified Bishop's method analysis by inputting soil parameters, slope geometry, and water table conditions to calculate the factor of safety.
10. Development of Geo-contour map by total station.
11. Estimation of axle load (msa) through IRC 37: 2018 using MS Excel.

12. Bituminous Mix Design using MS Excel: Using Marshall test data for various bitumen contents, calculate air voids, voids filled with bitumen (VFB), and bulk density. Prepare plots of bitumen content vs stability, flow, air voids, VBA, bulk density. Based on plots and standard criteria, determine Optimum Bitumen Content (OBC)
13. Design and analysis of multi-storey building using suitable civil engineering software tools.
14. Simulation of Flood Hydrograph Using HEC-HMS: To analyze rainfall-runoff response and generate Direct Runoff Hydrograph (DRH) for given watershed and storm events.
15. 1D Channel Flow Simulation and Water Surface Profile Analysis Using HEC-RAS: To perform steady/unsteady flow analysis in natural channels and compute water surface profiles for varying boundary conditions.
16. Groundwater Flow Modeling and Drawdown Analysis Using MODFLOW: To simulate groundwater flow in confined/unconfined aquifers and assess drawdown under different pumping scenarios.
17. Urban Storm water Drainage Design Using SWMM: To model urban storm water runoff, design drainage systems, under varying rainfall conditions.

In addition to above, various available open source software's will be used.

Course Outcomes

Upon completion of the course, the students will be able to:

CO 1: Design structural elements and multi-storey buildings using civil engineering software tools**.**

CO 2: Analyze water supply, stormwater drainage, and groundwater systems using tools like EPANET, SWMM, MODFLOW, and HEC-series.

CO 3: Practice MS Excel and SciLAB for solving geotechnical, transportation, and estimation problems including settlement, slope stability, axle load, and bituminous mix design.

CO 4: Produce land use land cover maps and geo contour maps using various software's.

CO 5: Demonstrate construction project planning and scheduling skills using various software's.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	2	2	1	2	2	2	3	3	3
CO2	3	3	3	2	3	2	2	1	2	2	2	3	3	3
CO3	3	3	3	2	3			1	2	2	2	3	3	3
CO4	3	2	2		3	2	3	1	2	2		2	3	2
CO5	2	3	3		3		2	1	3	3	3	3	3	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 2110712
Course Name: Creative Problem Solving

L	T	P	Credit
0	0	2	1

Course Objective:

To create interest in students to provide solutions to various on-field problems in civil engineering.

List of Experiments

1. Traffic Survey of Major Road's in the city.
2. Design of Traffic Signal.
3. Performance evaluation of new building materials.
4. Determination of residual life of structure.
5. Field assessment of soil bearing capacity for shallow foundations: Conduct a basic plate load test simulation or use empirical correlations (e.g., SPT or CPT data) to estimate the safe bearing capacity of soil at a local site in Gwalior.
6. Identification of solid waste collection problems in a locality and subsequent proposal of the solutions to those problems.
7. Determination of surface roughness index of road.
8. Use of waste materials for construction of pavement layers.
9. Creation of data bank of water resources in the city.
10. Industrial visit and joint solution of problems in industry.

Course Outcomes

Upon completion of the course, the students will be able to:

CO 1: Identify real-world civil engineering problems through field investigations and surveys.
CO 2: Apply appropriate engineering principles and techniques.
CO 3: Analyze identified engineering problems.
CO 4: Develop practical and innovative solutions to address field-based engineering challenges.
CO 5: Demonstrate critical thinking, collaboration, and communication skills in solving problems.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2		2	2	2	3	3	3
CO2	3	3	3	2	3	2	2		2	2	2	3	3	3
CO3	3	3	3	2	3	2	3	2	2	2	2	3	3	3
CO4	2	2	2	2	2	2	2	2	3	3	2	3	2	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 2110713
Course Name: Summer Internship Project - III

L	T	P	Credit
0	0	4	2

Course Objectives:

Develop an appreciation for the importance of civil engineering in infrastructure development, understand engineering principles for construction activities, emphasize the use of modern tools and equipment in the construction industry, build practical background and exposure to field problems, and develop technical skills for preparing project documents.

Syllabus:

Each candidate shall go for 1 month (4 week) on field training at different organizations/ sites of his / her choice after completion of their 6th Semester exams (in summer vacations) and shall submit a detailed report after completion of training.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Observe various activities of civil construction works.

CO2: Examine the utility of general and specific equipment for construction.

CO3: Differentiate the construction projects individually and in team.

CO4: Develop the writing and communication skills for various engineering problems.

CO5: Adapt lifelong learning for benefit of society.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	2	2	2	2	2	2	3	2	2
CO2	3	3	3	2	3	2	2		2	2	2	3	3	2
CO3	2	2	2		2	1		1	3	2	2	2	2	2
CO4	2	2	2		2	2		2	2	3	2	2	2	2
CO5	1	1	1		1	2	3	2	1	2	2	3	2	2

1 - Slightly; 2 - Moderately; 3 – Substantially