MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

(Scheme & Syllabus B.Tech Civil Engineering (2021-2022 onwards Admitted Batch))

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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

GROUP X: I Semester

B. Tech. I Semester (Civil Engineering)

For batches admitted in academic session 2021 – 22 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 Exam	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project							
1.	100011	BSC	Engineering Mathematics – I (BSC - 1)	50	10	20	20	-	-	-	100	3	1	-	4	Offline (4/0)	PP
2.	100012	BSC	Engineering Chemistry (BSC - 2)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	MCQ
3.	100014	ESC	Engineering Graphics (ESC - 1)	50	10	20	20	-	-	-	100	1	2	-	3	Offline (3/0)	A+O
4.	100015	HSMC	Energy, Environment, Ecology & Society (HSMC - 1)	50	10	20	20	-	-	-	100	3	-	-	3	Online (0/3)	MCQ
5.	100016	HSMC	Technical Language (HSMC - 2)	50	10	20	20	-	-	-	100	3	-	-	3	Blended (2/1)	PP
6.	100017	HSMC	Language Lab (HSMC – 3)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1/0)	SO
7.	100018	ESC	Engineering Graphics Lab (ESC - 2)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1/0)	SO
Total				**250**	**50**	**100**	**100**	**180**	**60**	**60**	**800**	**12**	**4**	**6**	**19**	-	-
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.																	

GROUP X: (Civil, Mechanical, Electrical and Automobile)

GROUP Y: (Electronics, Computer Science & Engineering, Information Technology, Electronics & Telecommunication, Chemical) 01 Theory Period = 1 Credit; 02 Practical Periods = 1 Credit

MCQ – Multiple Choice Questions, PP – Pen paper Mode, A+O – Assignment + Oral, SO – Submission + Oral, CLC: College Level Course

Mode of Teaching					Mode of Examination				Total Credits
Theory				Lab	Theory			Lab	
Offline	Online	Blended		Offline	PP	A+O	MCQ	SO	
		Offline	Online						
7	3	4	2	3	7	3	6	3	19
37%	16%	21%	10%	16%	37%	16%	31%	16%	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Scheme of Examination

GROUP X: II Semester

B. Tech. II Semester (Civil Engineering)

For batches admitted in academic session 2021 – 22 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 Exam	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project							
1.	110211	DC	Building Planning & Design (DC - 1)	50	10	20	20	-	-	-	100	3	-	-	3	Blended (2/1)	PP
2.	100020	ESC	Basic Civil Engineering & Mechanics (ESC - 3)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
3.	100021	ESC	Basic Mechanical Engineering (ESC - 4)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	MCQ
4.	100022	ESC	Basic Electrical & Electronics Engineering (ESC - 5)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	MCQ
5.	100023	ESC	Basic Computer Engineering (ESC - 6)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	A+O
6.	100024	ESC	Manufacturing Practices (ESC – 7)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1/0)	SO
7.	100026	ESC	Basic Civil Engineering Lab (ESC - 8)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1/0)	SO
Total				**250**	**50**	**100**	**100**	**240**	**80**	**80**	**900**	**11**	**4**	**8**	**19**	-	-
Summer Internship Project – I (Institute Level) (Qualifier): Minimum two-week duration: Evaluation in III Semester.																	

Mode of Teaching					Mode of Examination				Total Credits
Theory				Lab	Theory			Lab	
Offline	Online	Blended		Offline	PP	A+O	MCQ	SO	
		Offline	Online						
-	-	10	5	4	6	3	6	4	19
-	-	53%	26%	21%	32%	15%	32%	21%	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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B. Tech. III Semester (Civil Engineering)

For batches admitted in academic session 2021– 22 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.	100025	BSC	Engineering Mathematics – II (BSC - 3)	50	10	20	20	-	-	-	100	2	1	-	3	Offline (3/0)	PP
2.	110311	DC	Building Materials & Construction (DC - 2)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
3.	110312	DC	Fluid Mechanics - I (DC - 3)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
4.	110313	DC	Surveying (DC - 4)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
5.	110314	DC	Strength of Materials (DC - 5)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
6.	110315	DLC	Survey Practice Lab (DLC – 1)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1/0)	SO
7.	110316	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.	110317	DLC	Summer Internship Project–I (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline (2/0)	SO
Total				250	50	100	100	350	120	80	1050	10	5	16	23	-	-
10.	1000005	MAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ

***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

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	
		Offline	Online									
3	-	8	4	6	1	1	15	-	-	4	4	23
13%	-	35%	18%	26%	4%	4%	64%	-	-	18%	18%	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Scheme of Evaluation

B. Tech. IV Semester (Civil Engineering)

For batches admitted in academic session 2021– 22 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.	100028	BSC	Engineering Mathematics – III (BSC - 4)	50	10	20	20	-	-	-	100	2	1	-	3	Offline (3/0)	PP
2.	110411	DC	Geotechnical Engineering - I (DC - 6)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	MCQ
3.	110412	DC	Theory of Structure - I (DC - 7)	50	10	20	20	-	-	-	100	2	1	-	3	Offline (3/0)	PP
4.	110413	DC	Transportation Engineering (DC - 8)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	MCQ
5.	110414	DC	Water Resources Engineering (DC – 9)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
6.	110415	DLC	Civil Drawing Lab (DLC – 2)	-	-	-	-	60	20	20	100	-	-	2	1	Offline (1/0)	SO
7.	100009	MC	Cyber Security	50	10	20	20	-	-	-	100	2	-	-	2	Online (0/2)	MCQ
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
Total				300	60	120	120	230	60	60	950	12	5	8	21	-	-
9.	1000001	MAC	Indian Constitution & Traditional Knowledge	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ
Summer Internship Project-II (Soft skills Based) for two weeks duration: Evaluation in V 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

Mode of Teaching							Mode of Examination					Total Credits
Theory				Lab		NEC	Theory			Lab	NEC	
Offline	Online	Blended		Offline		Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online									
6	2	6	3	3		1	9	-	8	3	1	21
29%	10%	29%	14%	14%		4%	44%	-	38%	14%	4%	Credits %

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Scheme of Evaluation

B. Tech. V Semester (Civil Engineering)

For batches admitted in academic session 2021 – 22 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				L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem Exam	Continuous Evaluation								
				End Sem Exam	$Proficiency in subject /course	Mid Sem	Quiz/ Assign ment		Lab Work & Sessional	Skill Based Mini Project							
1.	110520	MC	Data Science	50	10	20	20	60	20	20	200	3	0	2	4	Blended (2/1)	MCQ
2.	110511	DC	Water Supply Engineering (DC - 10)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
3.	110512	DC	Theory of Structure – II (DC - 11)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
4.	110513	DC	Structural Design & Drawing (RCC) (DC - 12)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
5.	110514	DC	Fluid Mechanics – II (DC - 13)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
6.	110515	DLC	Minor Project – I (DLC – 3)**	-	-	-	-	60	40	-	100	-	-	4	2	Offline (2/0)	SO
7.	110516	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.	110517	DLC	Summer Internship Project–II (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline (2/0)	SO
Total				250	50	100	100	290	120	40	950	11	4	16	23	-	-
10.	1000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	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	Seminar	NEC	Theory			Lab	SIP/SLP/NEC	
Offline	Online	Blended		Offline	Online Mentoring	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online									
-	-	10	5	6	1	1	12	-	3	4	4	23
-	-	43%	22%	27%	4%	4%	52%	-	14%	17%	17%	Credits %

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Scheme of Evaluation

B. Tech. VI Semester (Civil Engineering) Tentative

For batches admitted in academic session 2021 – 22 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			MOOCS								
				End Sem.		Mid Sem	Quiz/ Assignment	End Sem	Lab Work & Sessional	Skill Based Mini Project	Assignment	Exam		L	T	P			
				End Term Evaluation	$Proficiency in subject /course														
1.	110620	MC	Artificial Intelligence & Machine Learning	50	10	20	20	60	20	20	-	-	200	3	-	2	4	Blended (2/1)	MCQ
2.	110621	DC	Wastewater Engineering(DC - 14)	50	10	20	20	-	-	-	-	-	100	2	1	-	3	Blended (2/1)	PP
3.	110622	DC	Structural Design & Drawing (Steel) (DC - 15)	50	10	20	20	-	-	-	-	-	100	2	1	-	3	Blended (2/1)	PP
4.	110623	DC	Estimating Costing & Contracting (DC - 16)	50	10	20	20	-	-	-	-	-	100	2	1	-	3	Blended (2/1)	PP
5.	1106XX	DE	Departmental Elective - I (DE - 1)*	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online (0/3)	MCQ
6.	910XXX	OC	Open Category Course – I (OC - 1)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended (2/1)	PP
7.	110624	DLC	Minor Project - II (DLC – 4)	-	-	-	-	60	40	-	-	-	100	-	-	4	2	Offline (2/0)	SO
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	-	-	50	-	-	2	1	Interactive	SO
Total				**250**	**50**	**100**	**100**	**170**	**60**	**20**	**25**	**75**	**850**	**15**	**3**	**8**	**22**	-	-
9.	1000007	MAC	Intellectual Property Rights	50	10	20	20	-	-	-	-	-	100	2	-	-	Grade	Online	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**															
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**

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	
		Offline	Online									
-	-	10	5	3	3	1	12	-	6	3	1	22
-	-	46%	23%	13%	13%	5%	55%	-	27%	13%	5%	Credits %

Departmental Elective I (SWAYAM/NPTEL) (DE-1)

1. 110661, Geotechnical Engineering II – Foundation Engineering
2. 110662, Concrete Technology
3. 110663, Air Pollution & Control

Open Category Course – I (OC-1)

1. 910111, Building Maintenance & Services
2. 910110, Sustainable Materials & Green Buildings

Scheme of Evaluation

B. Tech. VII Semester (Civil Engineering)

For batches admitted in academic session 2021 – 22 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			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.	1107XX	DE	Departmental Elective - II (DE - 2)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended (2/1)	PP
2.	1107XX	DE	Departmental Elective - III (DE - 3)*	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online (0/3)	MCQ
3.	1107XX	DE	Departmental Elective - IV (DE - 4)*	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online (0/3)	MCQ
4.	910XXX	OC	Open Category Course – II (OC - 2)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended (2/1)	PP
5.	110716	DLC	Software Application for Solving Civil Engineering Problem (DLC – 5)	-	-	-	-	60	20	20	-	-	100	-	-	2	1	Offline (2/0)	SO
6.	110717	DLC	Creative Problem Solving (DLC – 6)	-	-	-	-	25	25	-	-	-	50	-	-	2	1	Offline (2/0)	SO
7.	110718	DLC	Summer Internship project – III (Evaluation)	-	-	-	-	60	-	-	-	-	60	-	-	4	2	Interactive	SO
Total				100	20	40	40	145	45	20	50	150	610	12	-	8	16	-	-
8.	1000008	MAC	Universal Human Values & Professional Ethics	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															

$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

Mode of Teaching							Mode of Examination					Total Credits
Theory				Lab	MOOC	SIP	Theory			Lab	SIP/SLP/NEC	
Offline	Online	Blended		Offline	Online Mentoring	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online									
-	-	4	2	2	6	2	6	-	6	2	2	16
-	-	25%	13%	13%	36%	13%	36%	-	36%	13%	13%	Credits %

DE – 2	DE – 3 (Through SWAYAM/NPTEL)	DE – 4 (Through SWAYAM/ NPTEL)	OC – 2
110731. Hydraulic Structure	**110761.** Municipal Solid Waste Management	**110765.** Foundation Engineering	**910211** Integrated Waste Management for Smart City
110732. Advanced Structural Design (RCC)	**110763.** Principles of Construction Management	**110766.** Remote Sensing & GIS	**910212** Safety & Quality Management
110734. Industrial Waste Management	**110767.** Railway Engineering	**110768.** Indoor Air Pollution: Sources, Effects, Monitoring, Control and Modeling	

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

(For Batch Admitted in 2021-2022)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Periods per Week			Total Credits	Mode of Teaching	Mode of Exam
				Theory Slot			Practical Slot		MOOCS			L	T	P			
				End Sem.	Mid Sem.	Quiz / Assignment	End Sem.	Lab Work / Sessional	Assignment	Exam							
1.	1108XX	DE	Departmental Elective-V (DE-5)*	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ
2.	910XXX	OC	Open Category Course-III (OC-3)*	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ
3.	110821	DLC	Internship / Project**(DLC-7)	-	-	-	250	150	-	-	400	-	-	18	9	Interactive	SO
4.	110822	PD	Professional Development#	-	-	-	50	-	-	-	50	-	-	4	2	Interactive	SO
Total				-	-	-	300	150	50	150	650	6	-	22	17		
5.	Additional Courses for obtaining Honours or Minor Specialization by desirous students			Permitted to opt for maximum 02 additional courses for the award of Honours or Minor Specialization													

$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

#Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG program (participation in professional chapter activities, club activities, cultural events, sports, and personality development activities, collaborative events, MOOCs and technical events)

*** Innovation & Start-up: Only for the students who have opted relevant Novel Engaging Courses (NEC); Innovation: From Creativity to Entrepreneurship (Part 1-Idea Generation), Innovation: From Creativity to Entrepreneurship (Part 2-Technology, Science, Innovation, and Society), Introduction to Entrepreneurship: Challenges and Opportunities, and Start-up: How to start, survey, Financial, Legal, Pitching and Funding

Mode of Teaching							Mode of Examination					Total Credits
Theory			Lab	SIP/ Project	MOOC	PDC	Theory			SIP/Projects	PDC	
Offline	Online	Blended	Offline	Offline	Online Mentoring	Interactive	PP	A+O	MCQ	SO	SO	
		-	-	9	6	2	-	-	6	9	2	17
-	-	-	-	53%	35%	12%	-	-	35%	53%	12%	Credits %

DE – 5 (Through SWAYAM/NPTEL)	OC – 3 (Through SWAYAM/NPTEL)
110861. Introduction to Civil Engineering Profession	**910301.** Natural Hazards
110862. Plastic Waste Management	**910302.** Strategies for Sustainable Design
110864. Retrofitting and Rehabilitation of Civil Infrastructure	

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to R.G.P.V., Bhopal MP)

DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS B.Tech Civil Engineering

2021 ONWARDS ADMITTED BATCHES

SEMESTER-II

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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

Course Code: 110211

Course Name: Building Planning & Design

L	T	P	Credit
3	0	0	3

Course Objectives:

1. To make aware the student with sustainability aspects of building.
2. To impart knowledge to students about significance of building bye-laws & rules & regulation regarding building planning.
3. To impact knowledge to students regarding specific consideration required to be considered under Indian condition for planning & designing of building.
4. To appraise students about the rules & consideration to get adequate ventilation, lighting & Sound insulation for improved energy efficiency of building.
5. To make students understand about various essential requirements of different type of building.
6. To make aware students about green building rating for enhanced sustainability.

Syllabus:

Unit I

Natural Environment & Built environment, Ecology, Ecosphere - sustainable development, Dimensions of sustainability. Built Environment & liveability, integrated approach in design, challenges in sustainable development.Green environment, expectations from green building, IGBC, USGBC, LEED- GRIHA, SVA, GRIHA.

Unit II

Building Bye – laws, Functions of local authority, Terminology i.e. (Building line, control line, FAR, light plane etc.) Principles underlying building bye- laws, classification of building, requirements of parts of Buildings, site section of building, orientation, factors affecting orientation, orientation criteria's for Indian conditions. Provisions of NBC.

Unit III

Principles of planning of buildings (Aspects, prospect, Furniture requirement, rooming, grouping, privacy circulation etc.), Principles of architectural composition (Unity, contrast, scale, proportion, balance, Rhythm, character, etc.), Massing, Sun and the Building, Sun path, Sun shading & devices, Design of sun shades.

Unit IV

Thermal insulation, Heat transfer in building, Thermal insulation materials, methods of thermal insulation ventilation: natural & artificial, necessity & functional requirement of ventilation, system of ventilation, types of mechanical ventilation, air conditioning, functional requirement of air conditioning, Essentials of air conditioning, acoustic and sound insulation, Behavior of sound acoustical defects. Sabine formula, acoustical design of various spaces, sound insulation methods & materials, illumination (natural & artificial).

Unit V

Design and planning consideration for various types of building i.e. Residential Building, Education buildings, Hospitals & Dispensaries, Hotels, Commercial building, recreational buildings, government offices & other, standards specified by Bye-laws, various aspects of sustainability & energy efficiency applied to various types of Building, green building concept applied to various types of building.

Course Outcomes:

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

CO1: Explain basics of building planning & design.
CO2: Describe sustainability principle, by laws & characteristics of thermal and sound insulation.
CO3: Apply sustainability concepts & principles in planning & design of buildings.
CO4: Evaluate environmental, sustainable & safety aspects of a building.
CO5: Plan different types of buildings as per by laws &codal provisions.

Text Books:

1. Building Drawing (Built Environment), Sah, Kale and Pathi, Tata McGraw hill, 4th edition, reprint 2007
2. Building Planning, Designing and Scheduling, Gurucharan Singh, Standard Publisher, distribution, 2009
3. Building Design and Drawing, Mallik and Meo, Computech Publication Ltd New Asian; 5th edition 2009

Reference Books:

1. Building Design and drawing, Y.S.Sane, Standard Publisher, 2006
2. National Building Codes (LatestEdition), 2016 by Bureau of Indian Standards (Third Revision)
3. Building Construction, B.C.Punmia, Laxmi Publication, 11th edition, 2016

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Course Code: 100020

Course Name: Basic Civil Engineering & Mechanics

L	T	P	Credit
2	1	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: 100026
Course Name: Basic Civil Engineering Lab

L	T	P	Credit
0	0	2	1

Course Objectives:

1. To perform the chain & tape surveying
2. To perform the survey work using various types of compass.
3. To determine the location of object on ground surface.
4. To determine the properties of cement
5. To determine the properties of concrete
6. To determine the properties of bricks.

List of Experiments:

1. Measurement of distance by chain or tape.
2. Chain and tape survey of givenarea
3. Measurement of direction by prismatic compass & surveyor's compass.
4. Calculation of distance between two in accessible points by prismatic compass
5. Chain & compass traverse
6. Exercise of differential leveling by dumpy level.
7. Exercise of flying levelling by dumpy level.
8. Demonstration of theodolite.
9. Measurement of horizontal angle by theodolite.
10. Determination of standard consistency of cement by vicat apparatus.
11. Determination of initial setting time & final setting time of cement.
12. Determination of workability of cement concrete by slump cone test.
13. Determination of compressive strength of cement concrete.
14. Determination of compressive strength of bricks.
15. Determination of water absorption of bricks.

Text Books:

1. Surveying, Vol. – 1, Punmia B.C., Laxmi Publications, 17th edition, 2016
2. Building Material, B. C. Punmia, Laxmi Publications, 2016

Reference Books:

1. Basic Civil Engineering, S. Ramamrutam & R. Narayan, Dhanpat Rai Pub., 3rd edition, 2013
2. Surveying, Duggal, Tata McGraw Hill New Delhi, 4th edition, 2013

Course Outcomes:

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

CO1: Follow the guidelines for field surveying.

CO2: Follow the working principles of survey instruments for measurements.

CO3: Measure the horizontal distances, difference in elevation and angles of various points

CO4: Interpret survey data and compute areas

CO5: Determine various properties of cement, concrete & bricks.

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SEMESTER-III

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Course Code: 110311

Course Name: Building Materials & Construction

L	T	P	Credit
2	1	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, bond of aggregate, 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, organic impurities. Soundness of aggregates, Alkali-aggregate reaction, Alkali carbonate reaction, sieve analysis – Grading curves, Fineness modulus, Grading requirements, Grading of fine and coarse aggregates and Gap graded aggregates. Thermal properties of aggregates.

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

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, Nasser's ºK- probe test, Segregation and Bleeding of concrete, Mixing of concrete, Vibration of concrete, Different types of mixers and vibrators. Concreting in Hot weather and Cold weather.

Hardened Concrete**:** Compressive & Flexural strength of concrete, Stress and strain characteristics of concrete, drying shrinkage of concrete, Creep of concrete, Permeability and durability of concrete, Fire resistance of concrete, Thermal properties of concrete. Micro-cracking of concrete, methods of curing, Influence of temperature on strength, Fatigue & Impact strength 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

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Course Code: 110312

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: 110313

Course Name: Surveying

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To understand the working of theodolite.
2) To understand the determination of heights & distances by tacheometry.
3) To understand various types of curves used in practice.
4) To provide knowledge on setting out civil engineering works & detailed field surveying.
5) To understand the concepts of hydrographic & photographic surveying.

Syllabus:

Unit I

Traversing by theodolite, Fieldwork checks, traverse computations, latitude and departures, computations of co-ordinates, plotting & adjustment of traverse. Omitted measurements. Trigonometrical levelling, precise levelling.

Unit II: Tacheometry

Tacheometric systems and principles, stadia system, uses of anallactic lens, tangential system, substance system, instrument constant, field work reduction, direct reading tacheometers, use of tacheometry, accuracy.

Unit III: Curves:

Classification and use, elements of circular curves, setting out curves by offsets and by theodolites, obstacles and special problems, compound curves, reverse curves, transition curves, cubic spiral and lemineiscate, vertical curves, computation and setting out.

Unit IV: Control Surveys:

Providing frame work of control points, triangulation principle, forms of framework, reconnaissance survey, selection and making of stations, Control line, baseline measurement & corrections, flexible apparatus and corrections, computation of sides, precise traversing.

Unit V: Photographic & Hydrographic Surveying:

Principles of photographic surveying – aerial photography, tilt and height distortions, uses. Hydrographic Surveying - Methods, Elements of Hydrographic Surveying.

Course Outcomes:

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

CO1: Explain the techniques used for linear & angular measurements in surveying.
CO2: Analyse different geodetic methods of survey such as triangulation, trigonometric levelling, tachometry, photographic & hydrographic surveying.
CO3: Apply methods in control surveys.
CO4: Apply tachometry in traverse computations.
CO5: Apply various methods for setting curves, area & volume computations.

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 edition 2001
2. Plane & Geodetic surveying Vol. I & II, David Clark & J Clendinning, Constable & C. London, 2017
3. Surveying Vol. I & II, K.R. Arora, Standard book House, New Delhi, 13th edition 2016

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Course Code: 110314
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. Open and closed springs, leaf spring and spiral spring.

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:

- **CO1: Explain** the concepts of stress, strains, bending, deflection, buckling & torsion.
- **CO 2: Explain** various theories for determining stress, buckling of columns & deflections of structures.
- **CO 3: Apply** various theories for determining stress, buckling of columns & deflections of structures.

CO4: Evaluate the stresses in bending, shear and torsion.
CO5: Analyse various sections for stresses, strain, bending, torsion, buckling & deflections.

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.

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Course Code: 110315

Course Name: Survey Practice Lab

L	T	P	Credit
0	0	2	1

Syllabus:

List of Experiments:

1. Measurement of horizontal and vertical angle by Vernier Theodolite.
2. Theodolite, traversing.
3. Determination of R.L. of a point whose base is accessible & inaccessible by Trigonometrical levelling.
4. Determination of tachometric contents in field.
5. Determination of height & distance by using Stadia method & Tangential tachometry
6. Measurement of base line by using Substance Bar.
7. Setting out of a simple circular curve by using Rankine's method.
8. Setting out of a simple circular curve by using Offset from the chord produced or deflection distance.
9. Profile Levelling & Cross Sectioning of Road
10. Prepare Contour map by using Grid Pattern & Tachometric Method.
11. Resection by Two point problem & Three point problem.
12. Determination of horizontal & vertical position of a point by Total Station.
13. Traversing by Total Station.

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.

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Course Code: 110316

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: 110317

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.

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, Van Nostrand Reinhold Company

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SEMESTER-IV

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Course Code: 110411
Course Name: Geotechnical Engineering - I

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. Soil Mech. & Found Engg., S.K. Garg, Khanna Publishers, Delhi, 1st Edition, 2003
4. Basic & Applied Soil Mechanics, Gopal Ranjan, New Age International Publishers, 2016
5. 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: 110412

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: Double Integration method. Area Moment Method and Slope - Deflection Method. Beam of variable cross section, M/EI diagram, Conjugate Beam Method.

Unit-II

Virtual work and Energy Principles: Principles of Virtual work applied to deformable bodies. Maxwell's Reciprocal theorems, Energy theorems, Application to pin jointed frames only.

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: 110413

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: 110414
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.

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Course Code: 110415
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

SEMESTER-V

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Course Code: 110511
Course Name: Water Supply Engineering

L	T	P	Credit
2	1	2	4

Courses Objectives:

Students will be able to understand

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.

Courses 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.

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: 110512

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 classicalmethods 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 analysistechniques.
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, 9th edition, 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: 110513

Course Name: Structural Design & Drawing (RCC)

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To understand various design philosophies for RC components.
2) To study the desired properties of steel and concrete for use in Reinforced concrete.
3) To learn design of RC elements for flexure and deflection.
4) To learn design of RC elements for shear and bond as per relevant IS codes.
5) To learn design of RC elements subjected to compression.

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 Concerete 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

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Course Code: 110514
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 learnto use boundary layer theory anddrag.
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, 1st edition,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

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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

Course Code: 110515
Course Name: Minor Project – I

L	T	P	Credit
0	0	4	2

Course Objectives:

1) To develop an appreciation of civil engineering problems & have a feel of real life situations in planning & execution of projects.
2) To impart training of handling various types of civil engineering problems by use of conventional methods as well as software's.
3) To utilize the expertise in engineering to solve industry's technological problems.
4) To become innovative and professional in technology development, and system implementation.
5) To be able to function in their profession with social awareness and responsibility.
6) To be able to interact with their peers in industry and society as engineering professionals and leaders & inculcate a habit of working in a group.
7) Enable students to prepare professional reports for design projects and data presentation skill and to use computers and some computer graphics.

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.

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Course Code: 110516

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:

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.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Course Code: 110517

Course Name: Summer Internship Project – II

L	T	P	Credit
0	0	4	2

Course Objectives:

1) To make student acquire good oral & written communication skills.
2) To promote the habit of lifelong learning.
3) To prepare students develop adequate soft skills to be able to present their topic effectively 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.

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Course Code: 1000006

Course Name: Disaster Management

L	T	P
2	-	-

Course Objectives:

i) To understand basic concepts in Disaster Management
ii) To understand Definitions and Terminologies used in Disaster Management
iii) To understand Types and Categories of Disasters
iv) To understand the Challenges posed by Disaster
v) To understand Impact of Disasters key skills

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

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DATA SCIENCE (COURSE CODE 110520)

COURSE OBJECTIVES:

- To provide the fundamental knowledge of Data Science.
- To present the basic representation and exploratory data analysis used in DataScience.
- To understand the working of techniques used in Data Science.

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.

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List of Programs

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

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SEMESTER-VI

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Course Code: 110621

Course Name: Waste Water Engineering

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To impart basic knowledge on sewerage system including estimation of sewage quantity & design of sewers.
2) To provide a broad knowledge on sewage composition & its characteristics.
3) To provide information on disposal standards of effluents & also about various methods of sewage disposal.
4) To provide broad knowledge on various techniques of sewage treatment 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

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Course Code: 110622

Course Name: Structural Design & Drawing (Steel)

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To learn IS 800-2007 code of practice for the design of Compression, Tension and Flexural members using various cross-sections.
2) To understand the behavior of steel structural components subjected to gravity loads.
3) To study the design of bolted and welded connections.
4) To study the behaviour and design of compression and tension members using simple and built up sections.
5) To understand behaviour of flexural members and the design laterally restrained & unrestrained beams.
6) To design plate girders &stiffeners.

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

Introduction to plate girder. Design of plate girder. Design of slab bases for steel structures. 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 plate girder section and column bases.

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

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

Course Code: 110623

Course Name: Estimating Costing & Contracting

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To work out the quantities of various items of civil works like buildings, culverts including steel girders etc.
2) To compute earthwork.
3) To understand detailed specifications and carry out analysis of rates.
4) To understand various methods of carrying out estimation.
5) To understand valuation process &fixation of rent.
6) To understand 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

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Course Code: 110624

Course Name: Minor Project - II

L	T	P	Credit
0	0	4	2

Course Objectives:

1) To develop an appreciation of civil engineering problems & have a feel of real life situations in planning & execution of projects.
2) To impart training of handling various types of civil engineering problems by use of conventional methods as well as software's.
3) To utilize the expertise in engineering to solve industry's technological problems.
4) To become innovative and professional in technology development, and system implementation.
5) To be able to function in their profession with social awareness and responsibility.
6) To be able to interact with their peers in industry and society as engineering professionals and leaders & inculcate a habit of working in a group.
7) Enable students to prepare professional reports for design projects and data presentation skill and to use computers and some computer graphics.

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.

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Course Code: 910111

Course Name: Building Services & Maintenance

L	T	P	Credit
3	0	0	3

Course Objectives:

1. To learn about building services required in a building.
2. To learn about fire fighting systems in buildings.
3. To understand planning and maintenance requirements of lifts in high rise buildings.
4. To understand water management and planning system in a building.
5. To learn maintenance of building services and management of related tasks.

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.

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Course Code: 910110

Course Name: Sustainable Materials & Green Buildings

L	T	P	Credit
3	0	0	3

Course Objectives:

1. To expose the students to the concepts of sustainability in the context of building and conventional engineered building materials, such as Concrete, Bricks, and achieving the same through lower Carbon cements, Superior brick kilns and Recycled aggregate minimizing consumption of natural resources including water
2. To study the concepts of VOC and indoor air quality.
3. Exposing the student to concepts of embodied, Operational and Life Cycle Energy, Minimizing Energy consumption by optimal design, use of BIPV.
4. The course also intends to make student aware of ECBC, LEED, GRIHA etc.

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

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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110620 Artificial Intelligence & Machine Learning

COURSE OBJECTIVES:

1. To provide the fundamental knowledge of Artificial Intelligence, Neural Network and Machine Learning.
2. To present the basic representation and reasoning paradigms used in AI & ML.
3. To understand the working of techniques used in AI & ML.

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.
CO6: Build AI enabled intelligent systems for solving real world problems.

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Course Code: 1000007

Course Name: Intellectual Property Rights

L	T	P	Credit
2	0	0	GRADE

Course Objectives:

1. To acquaint the learners with the basic concepts of Intellectual Property Rights.

2. To develop expertise in the learners in IPR related issues and sensitize the learners with emerging issues in IPR and the rationale for the protection of IPR.

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: 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 V: Role of Patents in Product Development &amp: 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.

10. The Management of Intellectual Property. Edward Elgar Publishing Ltd.,2013.

11. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.

12. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.

13. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House.

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.

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ANNEXURE – II

SYLLABUS FOR DEPARTMENTAL ELECTIVE COURSES (DEs) TO BE OFFERRED IN VII SEMESTER

Course Code: 110731
Course Name: Hydraulic Structure

L	T	P	Credit
3	0	0	3

Course Objectives:

To study the design aspects of hydraulic structure including the selection of suitable sites, design principles of gravity and earthen dams, stability and seepage analysis, design of energy dissipaters, spillways, gates, and cross drainage structures, and gain basic knowledge of various hydropower plants and their components.

Syllabus:

Unit-I Gravity dams:
Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, evaluation of profile by method of zoning, practical profile, foundation treatment,construction joints, galleries in gravity dams.

Unit-II Earth and Rock fill dams:
Earth Dams: Types, causes of failure and design criteria, soils suitable for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.
Rock fill dams: Types, merits and demerits, conditions favourable for their adoption

Unit-III Cross drainage works:
Types, selection of suitable type, design criteria, fluming of canal- Mitra & Chaturvedi methods. Design of Different types of CD works.

Unit-IV Spillways, Energy dissipators and gates:
Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways. Principles of energy dissipation, Energy dissipators based on tail water rating curve and jump height curves, Spillway crest gates – vertical lift and radial gates, their design principles and details.

Unit-V Hydropower Plants:
Hydropower development, assessment of power potential, types of hydropower plants, general features of hydro-electric schemes, selection of turbines, draft tubes, surge tanks, penstocks, power house dimensions, development of micro hydel stations, tidal plants, pumped storage plants and their details.

Course Outcomes:

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

CO1: Analyze & Design Gravity Dams

CO2: Analyze & Design Earth Dams

CO3: Perform Canal Fluming & Design CD Works

CO4: Solve problems of Spillways & Energy Dissipators

CO5: Identify components of hydro project & assessment of power potential.

Reference Books:

1. Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds
2. Hydroelectric Hand Book by Creager
3. Hydraulic Structures by Varshney
4. Irrigation & Water Power Engg. By Punmia & Pandey
5. Water Power Engineering by Dandekar
6. Irrigation Engineering & Hydraulic Structure by S.K. Garg.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 110732

Course Name: Advanced Structural Design (R.C.C.)

L	T	P	Credit
3	0	0	3

Course Objectives:

To understand the behaviour of RC structures such as retaining walls, water tanks, highway bridges, and prestressed concrete girders; estimate design loads; and learn designing these structures using IS code provisions.

Syllabus:

Unit-I
Design of Water Tanks:
General design requirements; Design of circular tanks resting on ground; Design of rectangular tanks resting on ground; Design of underground tanks.

Unit-II
Over Head Water tanks and Flat Slabs:
Overhead Tank: Intze type (Membrane analysis only), Design of Staging
Design of Flat slabs: (i) Direct design method and (ii) Equivalent frame method; (iii) Design for Shear.

Unit-III
Earth Retaining Structures:
Types of retaining walls, Stability of retaining walls, Design of Cantilever type retaining wall; Design of Counterfort type retaining walls.

Unit-IV
Design of Bridges:
IRC loading for highway bridges, Design of Slab bridges for IRC Loads; Design of T-beams bridges for IRC Loads.

Unit-V
Prestressed Concrete:
Prestressing concepts, Materials; Systems of prestressing; Prestress losses. Introduction to working and limit state design method for prestressed beam sections.

Course Outcomes:

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

CO1 : **Design** water retaining structures (resting on the ground and underground) as per IS Code Provisions.

CO2 : **Design** of overhead water tanks & its staging; and Flat slabs as per IS Code Provisions.

CO3 : **Design** the Cantilever and Counterfort type retaining walls as per IS Code Provisions.

CO4 : **Design** the solid slab and T-beam type bridges as per Indian Codal Provisions.

CO5 : Analyze and design Prestressed Concrete sections as per IS Code Provisions.

Reference Books:

1. Plain and Reinforced Concrete by O.P. Jain and Jai Krishna Vol. I & II, Nem Chand & Bros, Roorkee
2. Reinforced Concrete Limit State Design by Ashok K. Jain, Nem Chand & Bros, Roorkee.
3. Reinforced Concrete Design by S. U. Pillai and D. Menon, Tata McGraw-Hill Publishing Company Limited, New Delhi.
4. Essentials of Bridge Engineering by D.J. Victor, Oxford and IBH publishers.
5. Design of Bridges by N.K. Raju, CBS Publishers
6. Prestressed Concrete by N.K. Raju, CBS Publishers
7. Advanced Reinforced Concrete Design by P. C. Varghese, Prentice Hall of India publisher
8. Prestressed concrete by T.Y. Lin & N.H. Burns, Wiley publisher

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 110734
Course Name: Industrial Waste Management

L	T	P	Credit
3	0	0	3

Course Objectives:
To provide a comprehensive understanding of sewage disposal methods, wastewater treatment techniques, effluent treatment plants, wastewater reuse, waste audits, and industry-specific waste management techniques.

Syllabus:

Unit-I:

Effects of wastes on streams and sewage treatment plant, natural purification of streams, oxygen sag curve, allowable organic load on streams, classification of stream, stream standards and effluent standards requirement of water for different purposes.

Unit-II:

Sampling of waste waters, Grab, Composite and Integrated samples, analysis of waste water, Biochemical Oxygen Demand, Chemical Oxygen Demand and pH value of waste water, Toxicity of waste by Bioassay method.

Pre-treatment of Wastes: Volume and strength reduction, source reduction of wastes, salvage of materials, recovery of by products, reuse of waste water.

Unit-III:

Equalization, Neutralization, Removal of suspended solids, removal of inorganic and organic dissolved solids, sludge treatment & disposal, Advance methods of treatment such as Adsorption, Reverse Osmosis, Ion Exchange Process, Electro Dialysis, etc.

Unit-IV:

Industrial Waste water and environmental impacts, Industrial waste survey, Industrial and common effluent treatment plants, zero effluent discharge systems, Waste management approach, Waste Audit – Evaluation of pollution prevention options.

Unit-V:

Brief study of industrial processes and treatment methods of waste water from common industries such as Textile, Dairy, Paper and pulp, Tannery, Distillery, petrochemicals, pharmaceuticals, fertilizers, cement & food processing.

Course Outcomes:

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

CO1: Explain basic concepts of industrial waste management.

CO2: Evaluate the effects of industrial waste on streams as per the standards.

CO3: Determine the requirements for safe disposal of sewage.

CO4: Apply suitable techniques for reduction & treatment of industrial waste & sludge.

CO5: Explain waste management techniques of different industries.

Text Books:

1. Industrial Waste Water Treatment – A.D. Patwardhan, PHI, Delhi
2. Waste Water Engg. – Treatment Disposal & Reuse – Metcalf & Eddy – Tata Mc Graw Hill, NewDelhi
3. Industrial Water Pollution Control – W.W. Eckenfelder, McGraw Hill, 1999.

Reference Books:

1. Wastewater Treatment – M.N. Rao & Dutta, Oxford & IBH Publishing House, New Delhi.
2. Waste Water Treatment – Arceivala – Tata Mc Graw Hill, New Delhi, 2006.
3. Industrial Waste Water Management hand book – N.S. Azad, Tata Mc Graw Hill, New Delhi
4. Pollution Control in Process Industries – Mahajan, Tata McGraw Hill, Delhi, 1984
5. Liquid Waste of Industries – Theories, Practice and Treatment – N.L. Nemerow, Wesley Publishing Co.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

ANNEXURE – III

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

Course Code: 910211

Course Name: Integrated Waste Management for Smart City

L	T	P	Credit
3	0	0	3

Course Objectives:

To provide a comprehensive understanding of planning, implementing, and managing waste including waste collection, treatment, disposal, energy recovery, and handling hazardous, electronic, and biomedical waste.

Syllabus:

Unit I:

Introduction to waste management, classification of solid waste, objective of solid waste management, principles of integrated waste management, 3R policy, various laws & rules of waste management (MSW Rules, hazardous waste management rules, E-waste rules etc.), role of various agencies in planning of waste management system, swachh bharat mission and smart cities program – implementation, current status, challenges and future trend of waste management.

Unit II:

Municipal solid waste – generation, composition, characterization, handling of waste at source, collection of waste – collection system, collection routes, collection equipments, transportation of waste, transfer stations, segregation and recycling of waste, 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:

Energy recovery from municipal solid waste - thermal conversion technologies, incineration, pyrolysis, gasification, environmental control system, biological & chemical conversion technologies, aerobic composting, anaerobic digestion, refuse derived fuels, other biological and chemical transformation methods.

Unit IV:

Hazardous waste management – characteristics, source, health effects, physiochemical treatment methods of hazardous waste, disposal of hazardous waste, Biomedical waste management – sources, health effects, issues in India, challenges, handling of biomedical waste.

Unit V:

E-waste management – sources, health effects, issues in India, challenges, handling of E-waste. Plastic waste management – types of plastics, sources of plastic waste, impacts of plastic waste, plastic waste management practices. Management of construction & demolition wastes.

Course Outcomes:

Upon completion of the course, the students 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 energy recovery from waste.

CO 4: Plan an effective & efficient waste management system.

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

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 910212
Course Name: Safety & Quality Management

L	T	P	Credit
3	0	0	3

Course Objectives:

To study the basics of quality and **safety** management ,learn Quality system standard their requirements and implementation , quality planning , quality assurance and quality improvement techniques , safety management , accident investigation process; risk management, safety guidelines and to investigate recent trends and practices in various industries related to quality and safety issues.

Syllabus:

Unit – I

Quality Management: Introduction – Definitions and objectives, Factors influencing construction quality; Responsibilities and authority; Quality plan; Quality Management Guidelines; Quality circles; cost of quality and safety; Quality transition - quality control and inspection; quality assurance; total quality management-principles, tools and techniques; Planning and control of quality during design of structures; Tools and techniques for quality management.

Unit – II

Quality Systems: Introduction - Quality system standard, ISO 9000 family of standards; Requirements-Preparing Quality System Documents; Quality related training; Implementing a Quality system; Third party Certification; Concepts of quality control- Objectives, definitions, and systems.

Unit – III

Quality Planning: Quality Policy, Objectives and methods in Construction industry; Consumers satisfaction, Ergonomics, Time of Completion, Statistical tolerance, Taguchi's concept of quality; Inspection procedures-Processes and products (materials and machinery); Total cost implication.

Quality Assurance and Quality Improvement Techniques:

Evolution of quality assurance, Objectives of quality assurance; Methods, Techniques and needs of quality assurance; Different aspects of quality Appraisals; Quality assurance in construction. Role of quality assurance in TQM process, Quality assurance standards. Developing and implementing quality assurance system, Quality Improvement Tools and Techniques, work study, method study and time study.

Unit – IV

Safety management : Planning for safety provisions, budgeting for safety, safety policy, Safety audit, safety management practices, safety survey, safety inspection, safety sampling, evaluation of performance of supervisors on safety; Construction hazards and safety guidelines; Overall accident investigation process; Risk management; Prevention techniques for construction accidents; Site management with regard to safety recommendations; Training for safety awareness and implementation; Construction safety and health manual.

Unit-V

Recent trends and Case studies: Quality and safety issues in steel construction, concrete construction (including pre-cast, and pre-stressed); computer aided hazard analysis.

Course Outcomes:

After this course, students will be able to:
CO 1: Explain the quality management systems and utilize the ISO 9000 family of standards.
CO 2: Improve the quality of the project through tools and techniques.
CO 3: Plan for quality assurance and safety of construction and other industrial projects.
CO 4: Analyse the quality control and quality improvement tools and Techniques.
CO 5: Identify and evaluate the quality and safety management practices in construction and other industries.

Reference Books:

1. B. G. Dale, Managing quality, 4th ed., Blackwell Publishing, Oxford, 2003.
2. D. Reese and J. V. Eidson, Handbook of OSHA construction safety and health, 2 n d ed.,CRC Press, Bocaaton, 2006.
3. F. Harris, R. McCaffer and F. Edum-Fotwe, Modern construction management, 6 t h ed.,Blackwell Publishing, Oxford, 2006
4. K. Knutson, C. J. Schexnayder, C. M. Fiori and R. Mayo, Construction managementfundamentals, 2 nd ed., McGraw Hill, New York, 2008.
5. S. J. Holt, Principles of construction safety, Blackwell Publishing, Oxford, 2008.
6. The Management and Control of Quality: Sixth edition: James R.Evans, William M.Lindsay.
7. Safety management by John V.Grimaldi Rollin H.Simonds.
8. ISO 9000 family of standard

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2	3								
CO2	3				3									
CO3	2	2		2	2	3	3							
CO4	2	3		2	3	2								
CO5	1	2		2	1									
CO6	1					2					2			

1 - Slightly; 2 - Moderately; 3 – Substantially

ANNEXURE – IV

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

Course Code: 110716

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 MATLAB, QGIS, and other relevant applications in civil engineering works.

List of Experiments:

1. Design and analysis of reinforced concrete beam using STADD software.
2. Design and analysis of reinforced concrete slab using STADD software.
3. Design MATLAB code to develop load-response curve for different load conditions for a beam designed of experiment 1.
4. Application of QGIS in preparation of vector map of major city and preparation of land use and land cover maps.
5. Determination of critical network for a construction project using PRIMEVERA/ MS-Project.
6. To prepare an estimation of Multi-storey building and Road using MS-Excel.
7. Design water supply networks through Hardy Cross method. (Loops, EPANET and other software's).
8. Design Sewer networks using Hidra software.
9. Development of Geo-contour map by total station.
10. Estimation of axel load (msa) through IRC 37: 2015 using MS Excel.
11. Design and analysis of multi-storey building using E-tabs software.

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 various beams, slabs & multistorey building's using various software's.
CO 2: Design water supply & sewer networks using various software's.
CO 3: Practice MS Excel in estimation works.
CO 4: Produce land use land cover maps and geo contour maps using various software's.
CO 5: Practice Primavera and MS-Project softwares.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1			2		1	1	1				1		2
CO2	1			2		1	1	1				1		2
CO3	2	2	1	2	2	2	2	2	2	1	1	2	2	2
CO4	2	1	2	2	1	1	1	2	2	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: 110717
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. Identification of occupational diseases.
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 various on field problems.
CO 2: Practice various methods to solve problems.
CO 3: Produce solutions to various problems.
CO 4: Demonstrate various problems solving skills.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 110718
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 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.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially