Semester-Wise General Scheme Structure & Important Guidelines for Flexible Curriculum

(Batch admitted in Academic Session 2024-25 onwards)

Abbreviations Used

L	Lecture
T	Tutorial
P	Practical
HSMC	Humanities and Social Sciences including Management Courses
BSC	Basic Science Courses
ESC	Engineering Science Courses
DC	Departmental Core
DE	Departmental Elective
SPC	Specialization Courses
OC	Open Category
DLC	Departmental Laboratory Courses
MOOC	Massive Open Online Course
MWS	Mandatory Workshop
SP	Semester Proficiency
SIP	Skill Internship Program
SLP	Self-learning Presentation
PSC	Professional Skills & Competencies
PDC	Professional Development Component
PBL	Project Based Learning
PC	Professional Certification
MAC	Mandatory Audit Course
NEC	Novel Engaging Course

Course Category wise Credit Distribution
(Batch admitted in Academic Session 2024-25 onwards)

Category Code	Name of Course Category	Total Credits allotted in Scheme	% Distribution of Credit
HSMC	Humanities and Social Sciences including Management Courses	01	1%
BSC	Basic Science Courses	06	4%
ESC	Engineering Science Courses	06	4%
DC	Departmental Core	69	42%
DE	Departmental Elective	15	10%
PSC	Professional Skills & Competencies	04	3%
OC	Open Category	08	5%
DLC	Departmental Laboratory Courses	14	9%
MWS	Mandatory Workshop	Audit Course	Audit Course
SP	Semester Proficiency	06	4%
SIP	Skill Internship Program	04	3%
SLP	Self-learning Presentation	01	1%
PDC	Professional Development Component	02	1%
PBL	Project Based Learning	18	11%
PC	Professional Certification	01	1%
MAC	Mandatory Audit Course	Audit Course	Audit Course
NEC	Novel Engaging Course	04	3%
SEP	Skill Enhancement Program	01	1%

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Department of Civil Engineering

Scheme of Evaluation

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

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional			L	T	P				
1.	11241101	DC	Civil Engineering Materials & Construction	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
2.	11241102	ESC	Computer Programming	20	20	30	30	-	-	100	2	-	-	2	Face to Face	MCQ	2 Hrs
3.	11241103	DC	Engineering Mechanics	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	11241104	DC	Building Design & Drawing	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
5.	11241105	ESC	Basic Electrical & Electronics Engineering	20	20	30	30	-	-	100	2	-	-	2	Face to Face	MCQ	2 Hrs
6.	11241106	DLC	Computer Programming Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	11241107	DLC	Electrical & Electronics Engineering Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	11241108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	11241109	PBL	Micro Project-I[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	11241110	ESC	Engineering Chemistry Lab[$$]	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				**100**	**100**	**150**	**150**	**380**	**120**	**1000**	**11**	**03**	**10**	**19**	-	-	-
12.	11241111	MAC	Universal Human Values & Professional Ethics (UHVPE)	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.	11241112	MWS	Mandatory Workshop on Indian Constitution and Traditional Knowledge at Department Level (Duration: Two Days)											GRADE	Interactive	MCQ	-
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.																	
Skill Internship Program (Soft Skill): Minimum 45 hours duration: To be credited in II Semester.																	

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses.

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

[$$] This course will be distributed in the I Year Group wise among the programmes where ever required.

[#] Micro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	0	3	3	0	0	0	2	1	1	0	0	0	1	1	1

Mode of Learning						Mode of Examination							Total Credits
Theory		NEC	Lab			Theory				Lab		NEC	
Face to Face	Online	Interactive	Face to Face	Experiential	Experimental	PP	AO	MCQ	OB	SO	AO	SO	
13		1	1	1	3	6		7		2	3	1	19
68.42%		5.26%	5.26%	5.26%	15.8%	31.6%		36.84%		10.52%	15.8%	5.26%	Credits %

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Department of Civil Engineering

Scheme of Evaluation

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

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional			L	T	P				
1.	11241201	DC	Surveying	20	20	30	30	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
2.	11241202	DC	Strength of Material	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	11241203	DC	Concrete Technology	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	11241204	DC	Fluid Mechanics – I	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
5.	11241205	BSC	Matrices & Calculus	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
6.	11241206	DLC	Building Materials & Construction Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	11241207	DLC	**Problem Solving through Python Programming**	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	11241208	SP	**Semester Proficiency[$]**	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	11241209	PBL	**Micro Project-II[#]**	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	11241210	ESC	**Engineering Physics Lab[$$]**	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
11.	11241211	HSMC	**Language Lab**	-	-	-	-	70	30	100	-	-	2	1	Blended	AO	-
12.	NECXXXXX	NEC	**Novel Engaging Course (Activity Based Learning)**	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
13.	SIP1XXXX	SIP	**Skill Internship Program (Soft Skills)**	-	-	-	-	60	-	60	-	-	-	2**	Experiential	SO	-
Total				**100**	**100**	**150**	**150**	**510**	**150**	**1160**	**12**	**04**	**12**	**24**	-	-	-
14.	11241212	MAC	**Sustainability & Environmental Science**	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
15.	11241213	MWS	**Mandatory Workshop on Indian Knowledge System at Department Level (Duration: Two Days)**											GRADE	Interactive	MCQ	-

Summer Semester of six-eight weeks duration will be conducted for makeup of I & II semester examination.

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

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

[$$] This course will be distributed in the I Year Group wise among the programmes where ever required.

[**] These credits will be transferred from Skill Internship Program (Soft Skills).

[#] Micro Project-II will be presented and evaluated through an interdisciplinary project evaluation committee.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
1	1	1	4	0	0	0	2	1	1	1	0	0	1	1	1

Mode of Learning							Mode of Examination							Total Credits
Theory		NEC	Lab				Theory				Lab		NEC	
Face to Face	Online	Interactive	Face to Face	Blended	Experiential	Experimental	PP	AO	MCQ	OB	SO	AO	SO	
15		1	1	1	3	3	6		9		4	4	1	24
62.5%		4.17%	4.17%	4.17%	12.5%	12.5%	25%		37.5%		16.67%	16.67%	4.17%	Credits %

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Department of Civil Engineering

Scheme of Evaluation

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

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	11242101	BSC	Transforms & Vector Calculus	25	25	20	30	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
2.	11242102	DC	Data Structures	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	11242103	DC	Fluid Mechanics – II	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	11242104	DC	Geotechnical Engineering – I	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	11242105	DC	Structural Analysis – I	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
6.	11242106	DLC	Fluid Mechanics Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	11242107	DLC	Survey Practice Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	SO	-
8.	11242108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	11242109	PBL	Macro Project-I[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	11242110	SLP	Self-learning/Presentation[$$$] (SWAYAM/NPTEL/MOOC)	-	-	-	-	40	-	40	-	-	2	1	Mentoring	SO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				125	125	100	150	350	90	940	11	05	10	21	-	-	-
12.	11242111	MAC	Cyber Security	25	25	20	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.	11242112	MWS	Mandatory Workshop on Mastering Competitive Success at Department Level											GRADE	Interactive	MCQ	-
Skill Internship Program (Institute Level) (Qualifier): Minimum 30 hours duration: To be credited in IV Semester																	

[$]Semester Proficiency – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

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

[#] Macro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

[$$$] Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance and presentation.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	1	0	4	0	0	0	2	1	1	0	1	0	1	1	1

Mode of Learning							Mode of Examination							Total Credits
Theory		NEC	Lab				Theory				Lab		NEC	
Face to Face	Online	Interactive	Face to Face	Mentoring	Experiential	Experimental	PP	AO	MCQ	OB	SO	AO	SO	
15		1	1	1	1	2			15		4	1	1	21
71.5%		4.76%	4.76%	4.76%	4.76%	9.5%			71.5%		19%	4.76%	4.76%	Credits %

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Department of Civil Engineering

Scheme of Evaluation

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

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block			L	T	P				
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	11242201	DC	Transportation Engineering – I	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
2.	11242202	DC	Water Supply Engineering	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	11242203	DC	Estimating Costing & Contracting	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	11242204	DC	Geotechnical Engineering – II	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	11242205	DC	Structural Analysis - II	25	25	20	30	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
6.	11242206	DLC	Transportation Engineering Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	11242207	DLC	Geotechnical Engineering Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	11242208	DLC	Civil Engineering Drawing Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	SO	-
9.	11242209	SP	**Semester Proficiency**[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
10.	11242210	PBL	**Macro Project-II**[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
11.	NECXXXXX	NEC	**Novel Engaging Course (Activity Based Learning)**	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
12.	SIP3XXXX	SIP	**Skill Internship Program (Institute Level)**	-	-	-	-	60	-	60	-	-	-	2**	Experiential	SO	
Total				**125**	**125**	**100**	**150**	**440**	**120**	**1060**	**11**	**05**	**10**	**23**	-	-	-
13.	11242211	MAC	**Project Management, Economics & Financing**	25	25	20	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
14.	11242212	MWS	Mandatory Workshop on Writing Research Articles: Idea to Publication at Department Level											GRADE	Interactive	MCQ	-
15.	11242213	MWS	Mandatory Workshop on Intellectual Property Rights at Department Level											GRADE	Interactive	MCQ	-

Summer Semester of six-eight weeks duration will be conducted for makeup of previous semester examination.

Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

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

[#] Macro Project-II will be presented and evaluated through an interdisciplinary project evaluation committee.

[**] These credits will be transferred from Skill Internship Program (Institute Level).

BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	0	5	0	0	0	3	1	1	1	0	0	1	1	2

Mode of Learning							Mode of Examination							Total Credits
Theory		NEC	Lab				Theory				Lab		NEC	
Face to Face	Online	Interactive	Face to Face	Blended	Experiential	Experimental	PP	AO	MCQ	OB	SO	AO	SO	
15		1	1		3	3			15		5	2	1	23
65.2%		4.35%	4.35%		13.05%	13.05%			65.2%		21.74%	8.71%	4.35%	Credits %

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Department of Civil Engineering

Scheme of Evaluation

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

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted								Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block		MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation	Assignment	Exam		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional											
1.	11243101	DC	Waste Water Engineering	25	25	20	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
2.	11243102	DC	Structural Design & Drawing (RCC)	25	25	20	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	11243103	DC	**Data Science**	25	25	20	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	11243104	DC	Transportation Engineering - II	25	25	20	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	112431XX	DE	**Departmental Elective* (DE-1)**	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
6.	11243105	DLC	Environmental Lab	-	-	-	-	70	30	-	-	100	-	-	2	1	Experimental	AO	-
7.	11243106	DLC	**Data Science Lab**	-	-	-	-	70	30	-	-	100	-	-	2	1	Experimental	AO	-
8.	11243107	SP	**Semester Proficiency$**	-	-	-	-	50	-	-	-	50	-	-	2	1	Face to Face	SO	-
9.	11243108	PSC	Professional Skills & Competencies - I	-	-	-	-	70	30	-	-	100	-	-	4	2	Face to Face	MCQ	2Hrs
10.	11243109	PBL	**Cornerstone Project**	-	-	-	-	70	30	-	-	100	-	-	4	2	Experiential	SO	-
Total				**100**	**100**	**80**	**120**	**330**	**120**	**25**	**75**	**950**	**11**	**04**	**14**	**22**	-	-	-
11.	11243110	MAC	**Supply Chain Management**	25	25	20	30	-	-			100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
12.	11243111	MWS	Mandatory Workshop on Internships: Explore, Apply and Excel at Department Level													GRADE	Interactive	MCQ	-
Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree																			

$Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

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

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

BSC	ESC	DC	DE	OC	DLC	NEC	SP	SIP	SLP	PDC	PSC	PBL	MAC	MWS
0	0	4	1	0	2	0	1	0	0	0	1	1	1	1

Mode of Learning					Mode of Examination							Total Credits
Theory		Lab			Theory				Lab			
Face to Face	Online	Face to Face	Experiential	Experimental	PP	AO	MCQ	OB	SO	MCQ	AO	
12	3	3	2	2			15		3	2	2	22
54.6%	13.6%	13.6%	9.1%	9.1%			68.1%		13.6%	9.1%	9.1%	Credits %

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Department of Civil Engineering

Scheme of Evaluation

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

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted								Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block		MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation	Assignment	Exam		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional											
1.	11243201	DC	Engineering Hydrology & Irrigation	25	25	20	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
2.	11243202	DC	Structural Design & Drawing (Steel)	25	25	20	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	11243203	DC	Artificial Intelligence & Machine Learning	25	25	20	30	-	-	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
4.	112432XX	DE	**Departmental Elective* (DE-2)**	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
5.	112432XX	OC	**Open Category Course (OC-1)**	25	25	20	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
6.	11243204	DLC	Structure Engineering Lab	-	-	-	-	70	30	-	-	100	-	-	2	1	Experimental	AO	-
7.	11243205	DLC	**Artificial Intelligence & Machine Learning Lab**	-	-	-	-	70	30	-	-	100	-	-	2	1	Experimental	AO	-
8.	11243206	SP	**Semester Proficiency$**	-	-	-	-	50	-	-	-	50	-	-	2	1	Face to Face	SO	-
9.	11243207	PC	Professional Certification	-	-	-	-	50	-			50	-	-	2	1	Blended	SO	-
10.	11243208	PSC	Professional Skills & Competencies - II	-	-	-	-	70	30	-	-	100	-	-	4	2	Face to Face	MCQ	2Hrs
11.	11243209	PBL	**Capstone Project**	-	-	-	-	70	30	-	-	100	-	-	4	2	Experiential	SO	-
Total				**100**	**100**	**80**	**120**	**380**	**120**	**25**	**75**	**1000**	**12**	**03**	**16**	**23**	-	-	-
12.	11243210	MAC	**Disaster Management**	25	25	20	30	-	-	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.	11243211	MWS	Mandatory Workshop on Placement Readiness: Building Resume and Mastering Interview at Department Level													GRADE	Interactive	MCQ	-

Skill Enhancement Program/Research Internship/On Job Training for Four weeks duration

Summer Semester of six-eight weeks duration will be conducted for makeup of previous semester examination.

Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree

$Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

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

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform.

HSMC	BSC	ESC	DC	DE	PC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	PSC	MAC	MWS
0	0	0	3	1	1	1	2	0	1	0	0	0	1	1	1	1

Mode of Learning						Mode of Examination						Total Credits
Theory		Lab				Theory			Lab			
Face to Face	Online	Face to Face	Experiential	Bended	Experimental	PP	AO	MCQ	MCQ	SO	AO	
12	3	3	2	1	2			15	2	4	2	23
52.2%	13%	13%	8.7%	4.4%	8.7%			65.2%	8.7%	17.4%	8.7%	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(Deemed University)

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

NAAC Accredited with A++ Grade

Department of Civil Engineering

Scheme of Evaluation

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

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted								Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block		MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation	Assignment	Exam		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional											
1.	112441XX	DE	Departmental Elective # (DE-3)	25	25	20	30	-	-	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
2.	112441XX	DE	Departmental Elective* (DE-4)	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
3.	112441XX	OC	Open Category Course* (OC-2)	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
4.	11244101	SEP	Skill Enhancement Program/Research Internship/ On Job Training	-	-	-	-	-	50	-	-	50	-	-	-	1**	Face to Face	SO	-
5.	11244102	DLC	Creative Problem Solving	-	-	-	-	-	50	-	-	50	-	-	2	1	Experiential	SO	-
Total				25	25	20	30	-	100	50	150	400	09	-	02	11	-	-	-
Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree																			

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

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform.

** These credits will be transferred from Skill Enhancement Program/Research Internship/On Job Training

\# Course run through MITS-DU MOOCs

HSMC	BSC	ESC	DC	DE	OC	DLC	NEC	SEP	SIP	SLP	PDC	PBL	MAC	MWS
0	0	0	0	2	1	1	0	1	0	0	0	0	0	0

Mode of Learning					Mode of Examination					Total Credits
Theory		Lab			Theory				Lab	
Face to Face	Online	Face to Face	Experiential	Experimental	PP	AO	MCQ	OB	SO	
3	6	1	1				9		2	11
27.3%	54.5%	9.1%	9.1%				81.8%		18.2%	Credits %

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NAAC Accredited with A++ Grade

Department of Civil Engineering

Scheme of Evaluation

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

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted								Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block		MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation	Assignment	Exam		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment													
1.	112442XX	DE	Departmental Elective* (DE-5)	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
2.	112442XX	OC	Open Category Course* (OC-3)	-	-	-	-	-	-	25	75	100	2	-	-	2	Online	MCQ	3 Hrs
3.	11244201	PBL	Industry Internship/ Research Internship/ Innovation & Start-up	-	-	-	-	280	120	-	-	400	-	-	20	10	Experiential	SO	-
4.	11244202	PDC	Professional Development##	-	-	-	-	-	50	-	-	50	-	-	4	2	Interactive	SO	-
Total				-	-	-	-	280	170	50	150	650	05	-	24	17	-	-	-
Summer Semester of six-eight weeks duration will be conducted to complete any backlog courses.																			
Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree																			

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

*Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

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 programme (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs, technical events, institute/department committees, etc.)

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	0	0	0	1	0	1	0	0	0	0	0	1	1	0	0

Mode of Learning					Mode of Examination					Total Credits
Theory		Lab			Theory				Lab	
Face to Face	Online	Interactive	Experiential	Experimental	PP	AO	MCQ	OB	SO	
	5	2	10				5		12	17
	29.42%	11.76%	58.82%				29.42%		70.58%	Credits %

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DEPARTMENT OF CIVIL ENGINEERING

Departmental Elective Courses
1. Hydraulic Structure
2. Railway Airport & Tunnel Engineering
3. Traffic Engineering & Design
4. Engineering Geology
5. Pavement Management System
6. Applied Stress Analysis
7. Green Buildings
8. Advanced Surveying
9. Bridge Engineering
10. Groundwater Development
11. River Hydraulics
12. Design of Earthquake Resistant Structures
13. Remote Sensing & GIS Applications in Civil Engineering
14. Ground Improvement Techniques
15. Rock Engineering
16. Building Information Modelling
17. Seismic Hazard Analysis
18. Watershed Management
19. Hydropower Engineering
20. Rehabilitation of Structures
21. Ecology and Stream Pollution
22. Finite Element Methods
23. Strategic Management in Construction
24. Energy Efficient Buildings

25. Design of Bridges
26. Sustainable Construction & Practices
27. Lean Construction
28. Photogrammetry and UAV
29. Geodesy and GNSS
Open Category Courses
1. Maintenance Management
2. Integrated Waste Management System
3. Air Pollution & Noise Pollution
4. Sustainable Materials & Green Buildings
5. Safety & Quality Management
6. Ecology and Stream Pollution
7. Environmental Impact Assessment
8. Greenfield Projects
9. Engineering Economics and Project Appraisal
10. Entrepreneurship for Engineers

Course Code: 11241101

Course Name: Civil Engineering Materials & Construction

L	T	P	Credit
3	0	0	3

Course Objective:

The course aims to equip students with a fundamental understanding of various building materials, their properties, and construction techniques. It focuses on material selection, sustainable practices, and the application of standards to ensure quality and safety in construction projects.

SYLLABUS

Unit-I

Stones: General, classification of rocks, sources of stones, rock forming minerals, texture and structure of rock, fracture of rock, uses of stones, test for stones, qualities of a building stone, Stone quarrying, tools for blasting, materials for blasting, Process of blasting, dressing of stones, deterioration of stones, preservation of stones, common building stones in India.

Bricks: Properties and uses of good brick earth, harmful ingredients in brick earth, classification of brick earth, manufacture of bricks, comparison between clamp burning and kiln burning, Bricks (classification, characteristics, preparation of clay, manufacturing, testing, types).

Unit II

Timber: Timber, (Classification, Structure & characteristics, seasoning and its methods, defects & diseases, preservation & various treatment testing), wood products and their applications.

Ferrous metals, steel, non-ferrous metals & alloys: Iron ores, manufacture of pig iron, types of pig iron, cast iron, castings, wrought iron, manufacture of steel, uses of steel, factors affecting physical properties of steel, magnetic properties of steel, defects in steel, market forms of steel, mechanical treatment of steel, Aluminum (its alloys & uses). Copper (its alloys & uses), Ceramics (classification, properties, commercial forms).

Paints: Paint varnishes & enamels (types, composition, method of application, defects)

Unit III

Mortar: Definition, sand, natural sources of sand, classification of sand, bulking of sand, properties of good sand, function of sand in mortar, test for sand, substitutes for sand, classification of mortars, properties, preparation uses of mortar, selection of mortar and tests.

Cement: Definition, composition of ordinary Portland cement, function of cement ingredients, harmful constituents of cement, manufacture, physical tests, storage & uses.

Lime: Classification of binding materials, sources of lime, constituents of limestone, classification of limestone, classification of limes, comparison between fat lime and hydraulic lime, manufacture of fat lime, natural hydraulic lime & artificial hydraulic lime, test for limestone.

Unit IV

Masonry construction, masonry classification, stone V/s brick masonry, Terms & Definition in stone & brick masonry, Comparison of brickwork and stonework, joints in stone masonry, dressing of stone. Brick masonry (bonds in brick masonry, characteristics of bonds, type of bonds), typical structures in brickwork.

Unit V

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.

Industrial waste materials – fly ash, blast furnace slag, granite & marble polishing waste and their uses. Agro waste materials (rice husk, bagasse, coir fibers and their uses. Special processed construction materials- geosynthetic, ferrocrete, artificial timber, artificial sand and their uses.

Books

1. Building materials by: - M.L. Gambhir, Tata Mc-grawHil education Pvt. Ltd.
2. Building material by :- S.K. Duggal ,New Age Publishers
3. Building construction by :- S.P.Arora, Bindra, Dhanpat Rai & Sons
4. Building construction by:- B.C. Punamia, A.K.Jain, Laxmi Publishers New Delhi
5. Building material by:- B.C. Punmia, Laxmi Publishers New Delhi

Course Outcomes

Upon completion of the course, a student will be able to

CO1: **Classify** rocks, stones and bricks understand their properties, uses, and preservation techniques.

CO2: **Describe** the characteristics, seasoning, preservation, and applications of timber and wood products and understand the manufacturing, properties, and applications of ferrous and non-ferrous metals, alloys, ceramics, and paints

CO3: **Explain** the properties and preparation of mortar, cement & Lime including the function and testing of mortar, cement & lime.

CO4: **Compare** stone and brick masonry, and the construction techniques, bonds, and jointing methods.

CO5: **Determine** the causes and prevention techniques for dampness, including anti-termite and waterproofing treatments.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241102

Course Name: Computer Programming

L	T	P	Credit
2	0	0	2

Course Objective:

- To understand the fundamentals of C programming including keywords, data type, functions etc.
- To acquire the ability to write a computer program to solve specified problems.
- To familiar with program structure and debugging process.
- To implement basic programming solutions using array, pointer, structures and file handling.

SYLLABUS

Unit I: Introduction to C Programming, Machine Level Languages, Assembly Level Languages, High Level Languages, Program Execution, Translation Process and compiler Installation, Problem solving using Algorithms and Flowcharts, Identifiers, Data Types, Constants, Keywords, Input/output Instruction, Operators and Expressions, Precedence of operators, ASCII codes.

Unit II: Decision Control, if statement, if-else statement, Nested if else statements, if else ladder, The conditional expression, Switch statement, Loops, While loop, do-while loop, For loop, nesting of for loops, Break and continue statement.

Unit III: Array, type of array, One dimensional Arrays, 2D array, Multidimensional Arrays, Strings, Basics of Pointers & Addresses, type of pointers, Application of pointers, Pointer to Pointer, Pointer to Array, Array of Pointers, Pointer to Strings.

Unit IV: Function Basics, Function Prototypes, Call by value, call by reference, passing string and array to function, Function returning address, Recursion, Structures, Dynamic memory allocation by malloc/calloc function, Union, Enumerators, typedef in c.

Unit V: File Handling, Defining and Opening a file, reading and writing in file, Closing Files, Input/output Operations on Files, Predefined Streams, Storage class, preprocessor commands, Command Line Arguments.

Recommended Books

1. Brian W. Kernighan and Dennis M. Ritchie, **The C Programming Language**, Prentice Hall of India.
2. Yashavant Kanetkar, **Let Us C**, BPB publication.
3. E. Balagurusamy, **Programming in ANSI C**, Tata McGraw-Hill.
4. Byron Gottfried, **Schaum's Outline of Programming with C**, McGraw-Hill.
5. Paul Deitel and Harvey M. Deitel, **How to Program**, Pearson Publication.

Course Outcomes

Upon completion of the course, a student will be able to

CO1: Define basic programming terms, syntax, algorithm and flow chart.

CO2: Solve computational problems using decision control and loops.

CO3: Design a program using the concept of Array, pointer and functions.

CO4: Explore file handling operations to work efficiently with files.

CO5: Apply programming concept to implement, debug and test any C program.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241103
Course Name: Engineering Mechanics

L	T	P	Credit
2	1	0	3

Course Objective:

The course intends to provide an understanding of the properties of areas and principles of statics and dynamics and its application for different engineering problems.

SYLLABUS

Unit-I

Forces and Equilibrium: Resolution and resultant of forces; Graphical and Analytical methods of concurrent and non-concurrent coplanar forces, free body Diagram, Introduction to force system in space; Applications of Equilibrium Concepts.

Unit-II

Friction: Laws of Coulomb friction, inclined plane; ladder friction; wedge friction, square threaded screws; belt friction; rolling resistance

Unit-III

Analysis of plane Trusses, method of joints, method of Sections. Shear force and bending moment diagram for statically determinate beams subjected to different types of loadings.

Unit-IV

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

Unit-V

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

Text book

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

Reference books

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

Course Outcomes

Upon completion of the course, a student will be able to

CO1: **Apply** basic laws of Mechanics for different types of force systems.

CO2: **Apply** the Laws of friction in engineering problems.

CO3: **Apply** the concept of equilibrium in statically determinate beams and trusses.

CO4: **Determine** the properties of areas for different shapes.

CO5: **Apply** the concepts of Kinematics and Kinetics for engineering problems.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241104
Course Name: Building Design & Drawing

L	T	P	Credit
2	1	0	3

Course Objective:

Main objective of the subject is to introduce students about basic principles of Building planning & principles of Architectural composition to enable them to plan various types of buildings. The course is also designed to familiarize the students with fundamental of various features & details of the major components of the buildings. Subject study will impart drafting skill of engineering & building drawing and drafting, floor plan, elevation, section to reveal salient features, knowledge of study of town planning will guide students to follow rules & regulations of town planning while designing a building.

SYLLABUS

Unit-1 Concept of Engineering Drawing:

Basics of instruments, Plane geometrical constructions, Plain and diagonal scale, Unit conversion and Exercises based on linear, area, volume and speed, scale of chord, curved and Arches.

Unit-2 Isometric projections:

Introduction, isometric scale, isometric axis, isometric view and isometric projections from orthographic views, orthographic views from pictorial view and exercise. Computer Aided Drafting using Auto CAD: Introduction, software's basic commands.

Unit-3 Drawings of Building elements:

Free-hand drawings of various building elements like, Various types of footings, Open foundations, grillage, pile , R.C.C. and Well foundations, Drawing & detailing of reinforcement in Building components, Drawings of door-Window frames, Various types of doors windows and ventilators, Lintels and Arches, Stairs and stair cases, Trusses, Floorings, Roofing, etc.,

Unit-4 Building Planning:

Provision of NBC, Building by-laws, Rules and regulations, Open area, Setbacks. F.A.R. Terminology, Principle of Architectural Composition (i.e. Unity, contrast, symmetry, Rhythm, Mass composition. etc.), Principles of planning, Solar path, Orientation.

Unit-5 Town Planning:

History & development of cities & towns, Rules & Regulation of town & country planning. Types of towns & cities i.e. Ribbon development, Satellite town, Centralized, Garden city etc, Problems of metro cities, case stagy – Chandigarh, Gandhi Nagar Pondicherry etc., planning of cities &amenities, smart city concept, Integrated facilities requirement for smart cities.

Reference Books

i) Building Design and Drawing by Mallick and Mao
ii) Building Drawing and Design by Sah, Kale and Pathi
iii) Building Design and Drawing by Gurucharan Singh
iv) Building Design and drawing by Y.S.Sane
v) N.B.C. (Latest Edition).

vi) Auto cad Software & Manual.

Courses Outcomes

Upon completion of the course, a student will be able to

CO1: Apply the skill of engineering drawing & drawing of various building elements.

CO2: Implement the rules & regulations according by-laws & NBC provision.

CO3: Apply various techniques of perspective drawing.

CO4: Develop planning insight and make acquaintance with various town planning related exercises.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241105

Course Name: Basic Electrical & Electronics Engineering

L	T	P	Credit
2	0	0	2

Course Objectives:

- To impart basic knowledge of the DC and AC circuits and their applications.
- To familiarize the students with the basic knowledge of magnetic circuits, transformer, rotating electrical machine and its terminology.
- To make familiarize the students about the working of various electronic circuits and its importance.

SYLLABUS

Unit- I D.C. Circuits Analysis:

Voltage and Current Sources: Dependent and independent source, Source conversion, Kirchhoff's Law, Mesh and Nodal analysis. Network theorems: Superposition theorem, Thevenin's theorem & Norton's theorem and their applications.

Unit- II Single-phase AC Circuits:

Generation of sinusoidal AC voltage, definitions: Average value, R.M.S. value, Form factor and Peak factor of AC quantity, Concept of Phasor, analysis of R-L, R-C, R-L-C Series and Parallel circuit, Power and importance of Power factor.

Unit- III Magnetic Circuits & Resonance:

Magnetic Circuits: Concept of MMF, flux and magnetic reluctance, Self and mutual inductances, Dot convention, coefficient of coupling and coupled circuits. Resonance: Series and Parallel resonance, Bandwidth, Q-factor and selectivity.

Unit- IV Single-phase Transformer & Rotating Electrical Machines:

Single phase transformer, Basic concepts, construction and working principal, Ideal Transformer and its phasor diagram at No Load, Voltage, current and impedance transformation, Equivalent circuits and its Phasor diagram, voltage regulation, losses and efficiency, testing of transformers, Construction & working principle of DC and AC machine.

Unit –V Digital Electronics, Devices & Circuits:

Number systems used in digital electronics, decimal, binary, octal, hexadecimal, their complements, operation and conversion, Demorgan's theorem, Logic gates- symbolic representation and their truth table, Introduction to semiconductors, Diodes, V-I characteristic, Bipolar junction transistors and their working, Introduction to CB, CE & CC transistor configurations.

Reccomended Books

1. Basic Electrical and Electronics Engineering, D.P. Kothari &I.J. Nagrath-Tata McGraw Hill
2. Basic Electrical and Electronics Engineering, V N Mittle & Arvind Mittal -Tata McGraw Hill
3. Basic Electrical and Electronics Engineering, S. K Bhattacharya -Pearson
4. Electrical Machinery- A.E. Fitzgerald, C. Kingsley and Umans - TMH
5. Principles of Electrical Engineering- Vincdent Del Toro- Prentice Hall.

6. Basic Electrical Engineering -A,E. Fitzgerald, Higginbotham and Grabel -TMH
7. Integrated Electronics- Millmann & Halkias

Courses Outcomes

Upon completion of the course, a student will be able to

CO 1. **Solve** dc & ac circuits by applying fundamental laws & theorems

CO 2. **Analyze** magnetic circuits and resonance characteristics of ac electric circuits

CO 3. **Describe** the working principle, construction, applications of single phase transformer & rotating electrical machines

CO 4. **Select** the logic gates for various applications in digital electronic circuits.

CO 5. **Explain** the characteristics and parameters of Diode and Transistor.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241106
Course Name: Computer Programming Lab

L	T	P	Credit
0	0	2	1

Laboratory Objectives:

- To Develop a knowledge of Computer Programming
- To Enhance Practical programming Skills to solve real world problems.

LIST OF EXPERIMENT'S

1. Write a program to add two numbers and display its sum.
2. Write a Program to calculate and display the volume of a cylinder for height and radius parameters to be input from the user.
3. Write a program to take input of name, roll number and marks obtained by a student in 5 subjects of 100 marks each and display the name, roll number with percentage score secured.
4. Write a program to swap values of two variables with and without using the third variable.
5. Write a program to illustrate the use of unary prefix and postfix increment and decrement operators.
6. Write a program to find the largest of three numbers using ternary operators.
7. Write a program to find the roots of quadratic equation.
8. Write a Program to Check Whether a Number is Prime or not.
9. Write a program to compute the grade of students using if else ladder as per MITS norms.
10. Write a program to check whether the entered year is leap year or not (a year is leap if it is divisible by 4 and divisible by 100 or 400.)
11. Write a program to print the sum of digits of a number using for loop.
12. Write a program to Display Fibonacci Sequence.
13. Write a program to display different kind of pyramid patterns using for loops.
14. Write a program to add two matrices of the same order.
15. Write a program to show the working of predefine functions in string.
16. Write a program to illustrate concept of function and different type of functions.
17. Write a program to find factorial of a number using recursion.
18. Write a program to find sum of natural numbers using recursion.
19. Write a program to illustrate concept of structure and union in c programming.
20. Write a program to show concept of file handling.

Course Outcomes:

Upon completion of the course, a student will be able to

CO 1. **Write** computer program in C language.

CO 2. **Apply** knowledge of programming to solve real-world problems

CO 3. **Apply** programming syntax to implement program.

CO 4. **Acquire** teamwork skill for working effectively in groups

CO 5. **Prepare** an organized practical file on experiments conducted in the laboratory.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241107

Course Name: Electrical & Electronics Engineering Lab

L	T	P	Credit
0	0	2	1

LIST OF EXPERIMENT'S

1. To verify Kirchhoff's Current Law & Kirchhoff's Voltage Law.
2. To verify Superposition Theorem
3. To determine resistance & inductance of a choke coil.
4. To determine active & reactive power in a single phase A.C circuit.
5. To determine voltage ratio & current ratio of a single phase transformer.
6. To determine the polarity of a single phase transformer.
7. To perform open circuit & short circuit test on a single phase transformer.
8. To study multimeter & measure various electrical quantities
9. To study of constructional details of DC machine.
10. To determine the V-I characteristics of diode in forward bias & reverse bias condition.

Course Outcomes:

Upon completion of the course, a student will be able to

CO 1. **Verify** circuit theorems.

CO 2. **Perform** tests on transformer for determination of losses, efficiency & polarity.

CO 3. **Acquire** teamwork skills for working effectively in groups

CO 4. **Prepare** an organized technical report on experiments conducted in the laboratory

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241109

Course Name: Micro Project – I

L	T	P	Credit
0	0	2	1

LIST OF MICRO PROJECTS

1. Build a model of a common household item (e.g., a lamp or a fan) and analyze the forces and moments to ensure it is in equilibrium.
2. Build a model of a simply supported beam and analyze the forces due to self weight and support reactions
3. Model a crane arm and investigate how various loads affect its equilibrium. Students can use free body diagrams and solve for forces and reactions.
4. Prepare list of the documents required for obtaining permission for construction of residential building/apartment from competent authority and write report.
5. Prepare report on Provisions given in National Building Code 2005.
6. Construct an inclined plane with adjustable angles and measure the frictional force for different materials and inclinations
7. Analyze and measure the friction forces acting on a ladder leaning against a wall and identify the conditions for ladder stability
8. Design a small pulley system with belts and study the effects of friction on the transmission of force and motion.
9. Collect and study building Bye laws, rules and regulation for planning as per local competent authority.
10. Study of Sustainable Building Materials
11. Thermal Insulation Properties of Building Materials
12. Build a truss bridge model and use the method of joints and sections to analyze the internal forces in the truss members.
13. Construct a physical or virtual model of a beam under various loads and draw shear force and bending moment diagrams.
14. Create a truss structure (e.g., a small tower) and test its ability to carry different loads, analyzing the forces in each member.
15. Draw developed plan, Elevation, section, site plan of public building.
16. Prepare list of the documents required for obtaining permission for construction of commercial building from competent authority and write report.
17. Brick Masonry Bond Strength Study
18. Fire Resistance of Construction Materials
19. Use different geometric shapes (e.g., circles, rectangles) cut from cardboard or similar materials to experimentally determine their centroid.

20. Create composite shapes from simpler geometries and calculate their centroid and using both theoretical and experimental methods.
21. Verify the principal moment of inertia by measuring and computing of different geometrical shapes.
22. Prepare a model of a simple building using card board showing different components with suitable colour.
23. Draw the plan of 2BHK house with suitable plot size.
24. Plan an acoustic effects for an auditorium.
25. Construct a simple mass-spring system and measure its natural frequency and amplitude of oscillations.
26. Analyze the motion of a rolling ball down an inclined plane, studying its acceleration and the forces involved
27. Design and test a simple undamped single degree of freedom system to study its free vibration characteristics.
28. Identification of different rock minerals with their properties.
29. Deterioration of stones with their causes and remedies.
30. Common building stones used in India with proper reasoning.
31. Different types of brick bonds with their applications.
32. Different types of masonry joints with their applications.
33. Damp in building- causes and control.
34. Comparison of stone work and brick work with proper applications.
35. Study on the Use of agro waste materials in construction.
36. Waterproofing Techniques for Concrete Structures
37. Corrosion in reinforcement- causes and control measures.
38. Study of artificial sand for construction.

Course Outcomes:

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

CO1: **Identify** the characteristics of various building materials.

CO2: **Develop** plan and model of buildings.

CO3: **Analyze** the friction forces, shear force, bending moment and single degree of freedom system.

CO4: **Cooperate** to work within group.

CO5: **Develop** the writing skills to prepare reports.

CO6: **Display** lifelong learning.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241110
Course Name: Engineering Chemistry Lab

L	T	P	Credit
0	0	2	1

Course Objectives: The main objective of the course is to enable the students to become familiar with the concepts of Modern Engineering Chemistry, and impart knowledge on the fundamental concepts of chemistry involved in application of several important engineering materials that are used in the industry/day-to-day life.

Syllabus:

UNIT -I Water Analysis

Source and impurities, alkalinity, pH, hardness of water, interrelationship between alkalinity and hardness, degree of hardness, Boiler troubles, Methods of hardness removal, Standards of water for drinking purposes.

UNIT -II Lubricants & Lubrication

Introduction, functions of lubricants, types and classification of lubricants, mechanism of lubrication, physical & chemical properties, testing of lubricants, types of greases, application of lubricants.

UNIT- III Chemical Fuels

Definition and classification of chemical fuels, Requirements of a good fuel. Calorific Value – HCV and LCV. Coal and its Ranking. Proximate and Ultimate analysis of coal. Knocking & Octane and Cetane numbers.

UNIT -IV Polymeric Material

Introduction, types and classification of polymers, Types of polymerization: addition or chain polymerization, condensation polymerization and their mechanism, Preparation of Phenol formaldehyde, Urea formaldehyde Resin.

UNIT- V Analytical Methods

Chromatography- Introduction & Principle of Chromatography, Introduction of Column, Thin layer, paper. Separation of colour pigments by Paper chromatography experiment.

Spectroscopy-Principle Instrumentation and Applications of Ultra-Violet, and Visible Spectroscopy, Absorption law, Verification of Lambert Beer's law, determination of concentration of solute in sample, and determination of λ max of sample solution.

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

CO 1: Select the best technique for Industrial and domestic water treatment.

CO 2: **Describe** the types, properties and application of lubricants.

CO 3: **Distinguish** the chemistry of various fuels and their combustion.

CO 4: **Describe** types, classification properties and applications of polymers and mechanisms of polymerization.

CO 5: **Explain** the concept of chromatography and spectroscopy for various engineering application.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

LIST OF EXPERIMENT'S

At least 10 of the following experiments must be performed during the session.

S. No.	Aim of experiment
1	Determination of Total hardness by Complexometric titration.
2	Determination of temporary and permanent hardness by Complexometric titration.
3	Determination of alkalinity of given water sample by neutralization Titration. (a) OH^- & CO_3^{2-} (b) CO_3^{2-} & $HCO3^-$
4	Determination of percentage of Fe in Iron alloy solution by redox titration.
5	Determination of percentage of Cr in Chromium alloy solution by back titration.
6	Determination of Cu in Copper alloys solution by Iodometric Titration.
7	Determination of Viscosity of given oil sample by Redwood viscometer No.1
8	Determination of Flash & fire points of given oil sample by Pensky Martin close cup Apparatus.
9	Determination of Flash & fire point of given oil sample by Cleveland's open cup Apparatus.
10	Determination of Moisture content, volatile matter content, Ash content and fixed Carbon of a given sample of coal by proximate analysis.
11	Separation of the colour pigment of spinach leaf by paper chromatography**.**
12	Preparation of phenol formaldehyde resin by condensation polymerization.
13	Preparation of urea formaldehyde resin by condensation polymerization.

Lab Course Outcomes: Upon completion of the course the student will be able to:

CO 1: Develop experimental skill required for application of chemistry in engineering.

CO 2: **Operate** different chemicals and instruments specified in course safely and efficiently.

CO 3: **Analyse** water sample, lubricants, fuel, alloys and ores for different properties.

CO 4: **Function** as a member of a team for problem solving.

Lab Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241111
Course Name: Universal Human Values & Professional Ethics

L	T	P	Credit
2	0	0	GRADE

Mode of teaching: The course is intended to be taught through lectures, discussions, case Studies, practice sessions, and assessment by self, peers, and instructor/teacher.

Course Objectives: The objective of the course is four fold:

1. Sensitization of student towards self, family (relationship), society and nature.
2. Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Content:

1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education:

- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as theprocess for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations ofevery human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

2: Understanding Harmony in the Human Being:

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of 'I' with the Body

3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship:

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient valuesin relationship
- Understanding the harmony in the society (society being an extension of family): Resolution,

Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

- Visualizing a universal harmonious order in society

4: Understanding Harmony in the Nature and Existence - existence as Coexistence:

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation innature
- Understanding Existence as Co-existence of mutually interacting units in all pervasive space
- Holistic perception of harmony at all levels of existence.

5: Holistic Understanding of Harmony on Professional Ethics:

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order

b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

- Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations

6: Gender Sensitization:

- Introduction to Sex, Gender & Culture
- Introduction to Women Studies and Socialisation, including man-woman relationship, work distribution
- A brief review of Feminism, Patriarchy, Feminist Studies, Feminist Ideologies.
- Women and Law Constitutional Provisions and Fundamental rights related to Women.

Course Outcomes: At the end of the course student will be able to

CO1. Become more aware of their surroundings, society, social problems and their sustainable solutions.

CO2. Become sensitive to their commitment towards what they believe in (humane values. humane relationships and humane society).

CO3. Apply what they have learnt to their own self in different day-to-day settings in real life.

CO4. Sustain human relationships and human nature in mind.

CO5. Have better critical ability.

CO6. Negotiate living in harmony with self and others.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Text Book

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Book

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. On Education - J Krishnamurthy
6. Siddhartha - Hermann Hesse
7. Old Path White Clouds - Thich Nhat Hanh
8. On Education - The Mother
9. Diaries of Anne Frank - Anne Frank
10. Life and Philosophy of Swami Vivekananda
11. Swami Vivekananda on Himself
12. Small is Beautiful - E. F Schumacher.
13. Slow is Beautiful - Cecile Andrews
14. Economy of Permanence - J C Kumarappa
15. Bharat Mein Angreji Raj - Pandit Sunderlal
16. Mahatma and the Rose
17. The Poet and the Charkha

18. Rediscovering India - by Dharampal
19. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
20. Swaraj by Arvind Kejriwal
21. India Wins Freedom - Maulana Abdul Kalam Azad
22. Ramakrishna ki jeevani - Romain Rolland (English)
23. Vivekananda - Romain Rolland (English)
24. Gandhi - Romain Rolland (English)
25. Autobiography of a Yogi – by Paramhansa Yogananda
26. Gandhi and Question of Science – Sahatsrabudhe

Course Code: 11241201

Course Name: Surveying

L	T	P	Credit
3	0	0	3

Course Objective:

The course aims to provide knowledge of surveying instruments, techniques for distance, direction, and elevation measurement, field surveying, setting out works, and the application of curves and specialized surveying methods.

SYLLABUS

Unit I Surveying Measurements:

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

Unit II Levelling & Contouring:

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

Unit III Tachometry & Traversing:

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

Unit IV Curves:

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

Unit V Surveying Techniques:

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

Text Books:

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

Reference Books:

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

Course Outcomes:

Upon completion of the course, a student will be able to

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

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

CO3: Apply various methods of surveying.

CO4: Analyze various techniques of controlling points.

CO5: Evaluate various methods for curve setting.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241202

Course Name: Strength of Material

L	T	P	Credit
2	1	0	3

Course Objective:

To understand the concepts of simple and compound stress & strain; behavior of elastic material in bending, shear and torsion; behavior of column with different end condition; stress and strain in pressure vessel; determine deflection in statically determinate structure

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.

Unit-II:

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-III:

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-IV:

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

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

Unit-V:

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

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, Higdon Style, 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

Course Outcomes:

Upon completion of the course, a student will be able to

CO1: Apply the concepts of simple stress and strain.

CO1: Apply the concepts of complex stress and strain.

CO3: Apply theory of simple bending in beams.

CO4: Apply the concept of pure torsion in shaft and determine the stresses in pressure vessels.

CO5: Evaluate columns & struts with different end conditions.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241203
Course Name: Concrete Technology

L	T	P	Credit
2	1	0	3

Course Objective:

The course intends to provide students with a comprehensive understanding of the materials, mix design, properties, testing, and applications of concrete in construction.

SYLLABUS

Unit-I Ingredients of Concrete:

Portland cement: Chemical composition of cement, Hydration of cement.

Cement: Types of Portland cement as per IS and ASTM classification, Fly ash; use of pozzolanas.

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.

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

Unit-II Fresh and Hardened Concrete:

Fresh Concrete: Workability of concrete, factors affecting workability, measurement of workability using slump test, Compaction factor test, Flow test, Vee-Bee Test, Ball penetration test, Segregation and Bleeding of concrete, Mixing of concrete, Vibration of concrete, Different types of mixers and vibrators.

Hardened Concrete: Mechanical properties 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.

Unit-III Testing & Quality Control of Concrete:

(a) Compression tests-cube test, Cylinder test, effect of end conditions on specimen and capping. Flexure test, splitting test, influence of size of specimen on strength, rebound hammer test, penetration resistance test, Pull-out-test, ultrasonic pulse velocity test.

(b) Field control for Quality of Concrete, Advantages of Quality Control, Statistical quality control, Measure of variability & its applications, Quality management in concrete construction.

Unit-IV Concrete Mix Design:

Basic considerations, factors in the choice of mix proportions, design of standard concrete mixes by IS code methods.

Unit-V Special Concretes:

High strength concrete, High performance concrete, Fibre reinforced concrete, Ready mixed concrete, Pumped concrete, mass concreting composites, Ferro cement, Light weight concrete, High density concrete, Cellular foam concrete, recent advances in concrete manufacturing.

Books Recommended:

1. Neville M. Properties of Concrete, ELBS, PHI Publishers
2. M.S Shetty, Concrete Technology, S. Chand Publishers
3. M.L Gambhir, Concrete Technology, McGraw Hill Publications
4. Varshney, Concrete Technology, Oxfiord Publications
5. Nawy E.G., Concrete Construction Engineering Hand Book, CRC Press
6. D.F. Orchard, Concrete Technology, App Science Publishers

Course Outcomes

Upon completion of the course, a student will be able to

CO1: **Explain** the basic components of concrete.

CO2: **Analyze** properties of fresh and hardened concrete.

CO3: **Apply** quality control measures in concrete construction.

CO4: **Design** concrete mixes using standard guidelines.

CO5: **Evaluate** the use of special concretes for advanced applications.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241204
Course Name: Fluid Mechanics - I

L	T	P	Credit
2	1	0	3

Course Objective:

To provide a comprehensive understanding of fluid properties, fluid continuum, kinematics and dynamics of fluid flow, fluid measurement mechanisms, simulation and dimensional analysis methods, and the concepts of laminar flow, enabling students to apply these principles to various fluid flow problems.

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.

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

Courses Outcomes

Upon completion of the course, a student will be able to

CO 1: Explain fundamental fluid properties & concepts of fluid statics.
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.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241205
Course Name: Matrices & Calculus

L	T	P	Credit
3	0	0	3

Course Objectives:

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigen values and eigenvectors and to reduce the quadratic form to canonical form
- To expose the concept of ordinary and partial differentiation
- Evaluation of improper integrals using Beta and Gamma functions.
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

SYLLABUS

Unit I Matrices-I:

Types of Matrix, Hermitian and skew Harmition matrix, unitary matrix, Matrix Rank of a matrix by Echelon Form and Normal Form, Inverse of Non-singular matrix by elementary transformation, solution of system of Homogeneous and non-homogeneous equations by elementary transformation, Consistency of equation.

Unit II Matrices-II:

Linear dependence of vectors, Eigen values and Eigenvectors with their properties, Cayley Hamilton theorem and its application to finding inverse of matrix, Diagonalization of a matrix

Unit III Differential Calculus –I:

nth Derivative ,Leibnitz's theorem, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables.

Unit IV Differential calculus-II:

Taylor's and Maclaurin's Theorems, Expansion of function of several variables, Jacobian, properties of Jacobian, Approximation of errors, Extrema of functions of several variables (Maxima and Minima of function of one and two variables), Lagrange's method of multipliers (Simple applications).

Unit V Integral Calculus:

Beta and Gamma function and its properties, transformation of Beta function, Gama functions, transformation of Gama function, relation between Beta and Gama function, Double and triple integrals, Change of order of integration, Application of Integration to Volumes and Surface areas.

Recommended Books:

1. E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10th Edition (2011).
2. C.L Liu: Discrete Mathematics, 4th Edition 2012.

3. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt. Ltd, 5th Edition (2016).

4. F. B .Hildebrand: Advanced Calculus for application, Englewood Cliffs, N. J. Prentice- Hall, 2nd Edition (1980).

5. B. S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Edition (2015).

6. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill Education, 1st Edition (2017).

Courses Outcomes:

Upon completion of the course, a student will be able to

CO 1. Solve the problem of matrix.

CO 2. Application of various matrix in engineering problems.

CO 3. Use of differential calculus.

CO 4. Apply differential calculus in basic engineering problems.

CO 5. Use integration techniques to determine the solution of various complex problems.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241206
Course Name: Building Materials & Construction Lab

L	T	P	Credit
0	0	2	1

Laboratory Objectives:

To provide students the practical knowledge of testing and assessing the properties of various building materials.

LIST OF EXPERIMENT'S

I. TEST ON FINE AGGREGATES

1. Gradation of aggregates.
2. Test for specific gravity.
3. Compacted and loose bulk density of fine aggregate.

II. TEST ON COARSE AGGREGATE

1. Determination of impact value of coarse aggregate.
2. Determination of elongation index
3. Determination of flakiness index
4. Determination of aggregate crushing value of coarse aggregate

III. TEST ON CONCRETE

1. Test for Slump
2. Test for Compaction factor
3. Test for Compressive strength - Cube & Cylinder

IV. TEST ON BRICKS AND BLOCKS

1. Test for compressive strength of bricks and blocks
2. Test for Water absorption of bricks and blocks
3. Determination of Efflorescence of bricks
4. Test on tiles

Course Outcomes:

Upon completion of the course, a student will be able to

CO 1. **Analyze** the properties of fine and coarse aggregates

CO 2. **Evaluate** concrete workability and strength

CO 3. **Assess** the quality of bricks and blocks for construction**.**

CO 4. **Understand** the durability and performance of building materials

CO 5. **Apply** testing knowledge to construction practices

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241207
Course Name: Problem Solving through Python Programming

L	T	P	Credit
0	0	2	1

Course Objectives:

- To apply various Python datatypes and Control Structure
- To Implement Classes and objects in Python
- To develop Python GUI.

Unit I

Introduction to Python: Setting up the Python environment (Anaconda, Jupyter Notebook), Basic syntax usage: variables, data types, and operators, First Python program, Control Structures: Conditional statements: if, elif, else, Looping constructs: for and while loops Nested control structures

Unit II

List/ Set/ Tuple operations: List, List Operations (Access, Slice, Append, Delete, Unpack, Loop etc), Tuple, Tuple operations (Access, Append, Delete, Unpack, Loop, etc.), Set, Set Operations (Access, Append, Delete, Method, Loop, etc.), Dictionary (Access, Append, Delete, Methods, Loop, etc.), Array (Access, Append, Delete, Methods, Loop, etc.) Strings: Reverse, Palindrome, Character count, Replacing Character

Unit III

Matrix and Array: Define matrix and print, Arithmetic operation between Matrix,

Functions and Modules implementation: Defining and calling functions, Function parameters and return values, Scope and lifetime of variables, Importing and using modules, In-Built Functions, Recursion, Lambda function

Unit IV

Classes, and Objects: Create class and object, Self-parameter, Attribut and methods, Implement Inheritance and polymorphism.

File Handling: Read and write to files, Working with CSV and JSON file, Implement try-except blocks, Debug a piece of code

Unit V

GUI: Work with Canvas, draw geometric shapes, Fill colour, Creating Simple GUI, GUI packages, Tkinter, Buttons, Labels, Entry Fields, Dialogs; Widget Attributes - Sizes, Fonts, Colours, Layouts, Nested Frames, Widget window – Bg, Bd, Cursor, font, Fg, Command, Minimal Application

Reference Books:

- "Python for Data Science For Dummies" by John Paul Mueller and Luca Massaron
- "Python Machine Learning" by Sebastian Raschka and Vahid Mirjalili
- "Python Web Scraping Cookbook" by Michael Heydt
- "Python GUI Programming Cookbook" by Burkhard A.
- "Python for Finance" by Yves Hilpisch.

List of Experiments:

1. Python Program to
    a. Generate a Random Number
    b. Convert Kilometers to Miles
    c. Check if a Number is Positive, Negative or 0
    d. Print the Fibonacci sequence
    e. Find ASCII Value of Character
    f. Shuffle Deck of Cards
    g. Display Calendar
2. Python Program to
    a. Display the Fibonacci Sequence Using Recursion
    b. Find the Sum of Natural Numbers Using Recursion
    c. Find the Factorial of Number Using Recursion
    d. Convert Decimal to Binary Using Recursion
3. Python Program to Add Two Matrices, Transpose a Matrix, Multiply Two Matrices
4. Python Program to
    a. Check Whether a String is Palindrome or Not
    b. Remove Punctuations from a String
    c. Sort Words in Alphabetic Order
5. Python Program to Illustrate Different Set, Tuple, and List operations.
6. Python Program to Iterate Over Dictionaries Using for Loop
7. Python Program to Catch Multiple Exceptions in One Line
8. Python Program to Copy a File
9. Python Program to Get Line Count of a File
10. Python Program to Find All Files with .txt Extension Present Inside a Directory
11. Python Program to Return Multiple Values from a Function
12. Write a Python program to create a person class. Include attributes like name, country, and date of birth. Implement a method to determine the person's age
13. Write a Python program to create a class representing a bank. Include methods for managing customer accounts and transactions.
14. Write a Python program to create a class representing a shopping cart. Include methods for adding and removing items and calculating the total price.
15. Create Python GUI using Tkinter
    a. Displaying Text and Images with Label Widgets
    b. Displaying Clickable Buttons with Button Widgets
    c. Getting User Input with Entry Widgets
    d. Getting Multiline User Input with Text Widgets
    e. Assigning Widgets to Frames with Frame Widgets
    f. Adjusting Frame Appearance with Relief

Course Outcomes:

Upon completion of the course, a student will be able to

CO1: Implement Python built-in functions and control statements.

CO2: Implement Python user-defined functions and classes.

CO3: Create Python GUI.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241209
Course Name: Micro Project – II

L	T	P	Credit
0	0	2	1

LIST OF MICRO PROJECTS

1. Calculation of Area by offset with reference to chain line.
2. Determine height of an object by trigonometrical levelling.
3. Traversing by Theodolite and tape.
4. Determine the distance between two inaccessible points by Prismatic/compass and tape.
5. Establish a regular pentagonal traverse by tape and Prismatic compass.
6. Conduct a profile levelling and cross-sectioning for a portion of proposed road.
7. Conduct a fly levelling to transfer Bench mark from one station point to another proposed station point.
8. Traversing by using Total station.
9. Locate building with respect to chain line by taking offsets.
10. Traversing by chain and Prismatic compass.
11. Study of Eco friendly self-compacted concrete.
12. Study of Eco friendly self-curing concrete.
13. Effect of ground water on concrete properties.
14. Study of ready mix concrete.
15. Design Mix of M-25 grade of concrete.
16. Design Mix of M-30 grade of concrete.
17. Design Mix of M-20 grade of concrete.
18. Comparative study on workability of different grade of concrete.
19. Study of pervious concrete.
20. Study of permeable concrete.
21. Use of ferro cement in concrete preparation.
22. Study of silica fume concrete.
23. Study of green concrete.
24. Non-Destructive testing of concrete
25. Study of light weight concrete.
26. Study of curing free concrete structure.
27. Study of fiber reinforced concrete.
28. Study of concrete workability using super plasticizers.
29. Study on durability of concrete in aggressive environments.

30. Investigation of the stability of floating objects, create charts comparing metacentric heights.
31. Study hydraulic similitude and scale modeling for different types of submerged bodies
32. Perform dimensional analysis for fluid systems like flow over spillways or pipe flow.
33. Study and classify flow regimes (laminar, transitional, and turbulent) for different engineering applications.
34. Analyze the variation of viscosity with temperature for different fluids and its impact on pipeline design.
35. Prepare a case study or report on how specific fluid properties (e.g., viscosity, surface tension, vapor pressure) influence the design of engineering systems like pipelines, pumps, or hydraulic systems.
36. Computation of capillary rise for different liquids in tubes of various diameters.
37. Develop an understanding of flow types and streamline behavior by visualizing the flow patterns and drawing streamlines.
38. Determine the impact of different material using Charpy impact test.
39. Determine the impact of differential material using Izod impact test.
40. Determine the tensile strength of different grade of steel and draw stress-strain curve.
41. Determine the compression strength of different grade of steel.
42. Evaluate the buckling strength of columns with different end conditions.
43. Determine the flexural stress in steel beam.
44. Determine the bending strength of simply supported beam using one point loading.
45. Determine the bending strength of simply supported beam using two point loading.

Course Outcomes:

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

CO1: **Develop** proficiency in surveying techniques for Infrastructure Layout and Analysis

CO2: **Analyze** the properties and performance of various concrete types and design sustainable concrete mixes to meet specific construction requirements.

CO3: **Evaluate** the properties of different materials.

CO4: **Analyze** fluid properties and flow behavior for engineering systems

CO5: **Develop** the writing skills to prepare reports.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241210
Course Name: Engineering Physics Lab

L	T	P	Credit
0	0	2	1

Course Objective:
The main objective of the course is to enable the students to become familiar with the key areas of physics that are fundamental to emerging technologies and impart knowledge about Quantum mechanics, Lasers, Fiber Optics, Holography, Superconductor, Nano materials, Dielectric materials.

Syllabus:

Unit I Quantum mechanics:

Planck's quantum hypothesis, Wave-particle duality of radiation, de-Broglie matter waves, Compton effect, Phase and group velocity, Heisenberg uncertainty principle and its applications.

Unit II Lasers:

Properties of lasers, the basic process of lasers, Population-inversion, classification of lasers, working of He-Ne, Ruby, Nd: YAG and CO_2 lasers, Applications of Lasers in Communication, Medical and Industry.

Unit III Fiber Optics:

Light guidance through optical fibers, the qualitative idea of critical and acceptance angle, types of fibers, numerical aperture, V-Number, intermodal &material dispersions in fiber.

UNIT IV Semiconductors & Nanomaterials:

Semiconductor basics P type-N type, Fermi function, Junction Diodes, LED and its working principle, Transistor.

Nanomaterials: Basic principle of nanoscience and technology, Quantum confinement effect and applications and Properties of quantum dots and Carbon nanotubes, Two-dimensional materials, Metal nanoparticles.

UNIT-V Dielectrics Materials:

Polar and Non-Polar Dielectrics, Dipole moment and Polarization, Dielectric constant& Polarization, Relation between electric field vectors E, P and D. applications of dielectrics.

Course Outcomes:

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

CO 1: Explain the quantum physics and applies it to the behavior of a system at the microscopic level and solve the problems.

CO 2: **Interpret** the requirements classification, properties and application of laser.

CO 3: **Describe** the basic concepts about optical fibers.

CO 4: **Explain** the principle, types, properties and application of semiconductors and nano-materials.

CO 5: **Apply** the knowledge of characteristic of Dielectrics and Piezoelectric materials.

Course Articulation Matrix:

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

1 - Slightly; 2 - Moderately; 3 – Substantially

LIST OF EXPERIMENT'S

At least 10 of the following experiments must be performed during the session.

S. No.	Aim of experiment
1	To determine the specific charge (e/m) of an electron by Thomson method.
2	To measure the planks constant using light emitting diode.
3	To determine the energy band gap of a given sample material.
4	To measure the dielectric constant of a substance by resonance method.
5	To study and verify the outputs of various logic gates
6	To study the input and output characteristics of a transistor in common BASE/Emitter/collector (anyone) configuration
7	To study the V-I characteristics of semiconductor diode
8	To study V-I Characteristics of LED
9	To determine the numerical aperture of given optical fiber using optical fiber kit.
10	To determine the wavelength of laser light with laser educational kit.
11	To measure the optical power attenuation in the given optical fiber.
12	To determine the V-number of given optical fiber using optical fiber kit.

Lab Course Outcomes: Upon completion of the course the student will be able to:

CO 1: Develop experimental skill required for application of physics in engineering.

CO 2: **Operate** different instruments specified in course safely and efficiently.

CO 3: **Demonstrate** the working principles in optics, semiconductors, Quantum Physics.

CO 4: **Function** as a member of a team for problem solving.

Lab Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241211
Course Name: Language Lab

L	T	P	Credit
0	0	2	1

Course Objectives:

- The course intends to build the required communication skills of the students to communicate effectively in real-life situations like starting a talk and be comfortable using English language.
- It aims at teaching students to appreciate English language through the study of scientific, creative, and academic text.
- The course is designed to acquaint students with structure of English language used in literature, functional varieties, figurative language, and verbal concomitance.
- The students are expected to enrich their knowledge of language, culture, and ethics through this course.

Course Contents:

Unit I: Communication [CO1, CO2]

Communication: Approaches, Elements, Verbal and Nonverbal Communication; Barriers to Communication; Johari Communication Window.

Unit II: Listening [CO1, CO2]

Listening: Factors Affecting Listening and Improving Listening.

Unit III: Speaking: [CO2, CO3, CO5]

Public Speaking & Delivering Presentation.

Unit IV: Reading: [CO3, CO4, CO5]

Reading Passages & Comprehension: Steps and Methods.

Unit V: Writing: [CO4]

Writing: Essentials of good writing; Drafting CV/biodata/Résumé)

***Reading Material for story and poetry is to be selected by concerned teacher in class.**

Language Laboratory:

The objective of the language lab is to expose students to a variety of listening and speaking drills. This would especially benefit students who are deficient in English and it also aims at confidence building for interviews and competitive examinations.

The Lab is to cover following syllabus.

1. Communication lab exercises as specified in Lab Manual
2. Listening skills (using Marc Hancock, CUP).
3. Speaking skills
4. Oral presentation.

Laboratory Tasks:

Lab Exercise No. 1 **Listening**
Learning Objectives: 1. The student will learn the correct pronunciation and acquire knowledge English sound system. 2. The student will understand the need of learning proper pronunciation and its help in picking context and spellings. 3. He will get a pre hand knowledge of TOEFL and IELTS exams. 4. The student will learn to differentiate between hearing and listening. **5.** The student will learn to listen and identify sound, pick context, infer meaning, and to retain the sound 'heard.'
Referred books and tools: 1. English Pronunciation in Use by Marc Hancock 2. Listening Exercises from English Pronunciation in Use by Marc Hancock or assigned by teacher taking class on spot. 3. Material will be selected by the teacher taking respective class and used as exercises. (A Sample exercise is appended at last) **4.** Oxford Advanced Learner's Dictionary [free online version]

Lab Exercise No. 2 **Vocabulary Exercise** **Word for Word**
Learning Objectives: 1. The student will learn to differentiate between words that look similar but are different in meaning and use. 2. The student will also learn to use such words in sentences so as to differentiate between these words.
Referred books and tools: 1. The exercise has been modelled on a book titled Word for Word by Clark Pointon published by OUP, India. 2. The students will also learn to form structures of a sentence.

Vocabulary Word for Word

Student is required to distinguish between these set of words on following basis:

- Part of speech
- Pronunciation

- Meaning
- Usage – using them in sentences
- Synonym
- Antonym

Lab Exercise No. 3

Speaking

Learning Objectives:

1. The student will get hands on practice on delivering a short speech or a talk.
2. The student will develop confidence while speaking.

Presentation: 01

Guidelines for delivering the Project:

Students will have to deliver a 10 Minute presentation preferably on Power Point.

1. He will be judged on basis of Presentation rubrics available in shared document folder for I Year students.
2. They can choose a topic of their choice but the same should be from the syllabi—from any paper under study in I/II Semester/I Year
3. The students will have to communicate the same to the teacher in advance before delivering the same, and get the topic approved. The teacher can change, modify, and suggest one instead.
4. The students will be allowed to share their screen and present the same online in laboratory sessions and in additional classes as called by the teacher.
5. The marks/grades for the same will be displayed on their moodle portal.
6. All students will also be required to submit the PPT (preferable uploading the same on google drive shared folder for the purpose).
7. The said activity has to be completed before the teaching ends.

Book Review: 02

Guidelines for delivering the Project:

Students will have to review a book namely, a novella, a travelogue, a memoir, Science text from short-listed books.

1. He will have to deliver a Presentation, Oral/PPT as per individual choice, in a prescribed format either online or offline as decided by the respective teacher.
2. Student will also have to submit a written report based on that.
3. There will be online sessions for each class by the teacher assigned to teach branch.
4. The students will be allowed to share their screen and present the same online in laboratory sessions and in additional classes as called by the teacher.
5. The marks/grades for the same will be displayed on their moodle portal.
6. All students will also be required to submit the PPT or the written assignment in doc/jpeg/pdf format (preferable uploading the same on google drive shared folder for the purpose).

7. The said activity has to be completed before the teaching ends.
8. The lists of books adopted by the students have to be one from the lists allocated for the purpose.

Rationale:

1. This will give students a practice how to deliver presentations on a variety of topics in his/her core stream.

Lab Exercise No. 4

Reading

Learning Objectives:

1. The student will get hands on practice on skimming and scanning.
2. The student will also learn role of language in communicating Meanings.

Referred books and tools:

1. The student will be provided passages to read. This will include:
   a. A passage from Science/Engineering text
   b. A short Story
   c. A Poem
2. Material will be adapted in discussion with the student by the teacher.

Sample Examples Include:

1. Passage, The Language of Science (Open Source)
2. Story, Araby (James Joyce), The Fatalist (I B Singer), A Horse & Two Goats (R K Narayan) etc.
3. Poem / Song

Rationale:

1. The student will learn to differentiate how the use of words varies from a scientific to a literary text and how meanings are construed.

Course Outcomes:

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

CO 1: Speak clearly effectively and appropriately in a public forum to a variety of audiences and purposes. (LOT1)

CO 2: **Prepare** oral dialogues and arguments within the Engineering Profession effectively. (LOT2)

CO 3: **Demonstrate** knowledge and comprehension of major text and traditions in language as well as its social, cultural, and historical context. (LOT3)

CO 4: **Read** a variety of Text analytically to demonstrate in writing and/or speech the interpretation of texts. (HOT4)

CO 5: **Interpret** text written in English assessing the results in written and oral arguments using appropriate material for support. (LOT3)

Reference Books:

- Understanding Human Communication — By Ronald Alderman by OUP
- Communication Skills for Engineers — Pearson Education.
- Practical English Grammar by Thomson Martinet — Oxford University Press
- A Handbook of Language laboratory by P Sreekumar — Cambridge University Press.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11241212
Course Name: Sustainability & Environmental Science

L	T	P	Credit
2	0	0	GRADE

Course Objectives:

To equip students with a comprehensive understanding of environmental science, pollution control, sustainability, and global frameworks, enabling them to analyze environmental challenges and contribute to sustainable solutions through informed decision-making and responsible practices.

SYLLABUS

Unit I

Introduction to Environmental Science: definition, importance and its components. Ecosystem and its components. Water cycle, carbon cycle, food chain, energy flow in ecosystem. Current state of environment in India and world; Underlying reasons (root causes) of modern environmental degradation (social, psychological, cultural). Introduction to Environmental pollution: air, water, noise, soil, thermal and radioactive.

Unit II

Environmental Pollution and Management: air, water, noise, soil, thermal and radioactive. Causes, impacts, pollution control techniques and mitigation strategies. Solid waste management: Principles of waste management, different components of waste management system and introduction to management of hazardous waste like e-waste, plastic waste. Global environmental Issues: Climate change, global warming, ozone layer depletion, urban heat island.

Unit III

Environmental policies and laws in India: Environmental Protection Act, Water Act, Air Act. **Overview of global environmental policies and frameworks**: Kyoto protocol, Montreal protocol, COP summits. Introduction to clean development mechanism, carbon credit, carbon trading. Environmental audit.

Unit IV

Sustainability concepts: definition, importance, pillars of sustainability (economic, environmental, and social). Sustainable development. Overview of UN Sustainable Development Goals (SDGs) and their global relevance. Concept of circular economy, resource efficiency, energy conservation, green buildings and sustainable manufacturing.

Unit V

Sustainable Energy solutions: New energy sources: need of new sources, different types of new energy sources, application of hydrogen energy, ocean energy sources, and tidal energy conversion. Concept, origin and power plant of geothermal energy. Renewable energy sources like water, wind etc. Overview of sustainable materials and construction practices. Introduction to sustainable transportation systems and sustainable water infrastructure.

Course Outcomes:

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

CO 1: Explain the fundamental concepts of environmental science, including ecosystems and the causes of environmental degradation.

CO 2: **Analyze** the sources, causes, and impacts of air, water, and solid waste pollution and propose appropriate mitigation strategies.

CO 3: **Evaluate** the effectiveness of environmental policies and global frameworks in addressing environmental challenges.

CO 4: **Explain** the concepts of sustainability and sustainable development goals.

CO 5: **Apply** various solutions for achieving sustainable development.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Reference Book

1. D. K. Asthana, Meera Asthana, A Text Book of Environmental Studies, S Chand & Co., New Delhi.
2. S. K. Dhameja, Environmental Engineering & Management, S K Kataria & Sons, New Delhi
3. C. S. Rao, Environmental Pollution Control Engineering, C.S. Rao, New Age International Publishers
4. A. K. Gupta, Environmental Sustainability and Green Technologies, PHI Learning.

Course Code: 11242101

Course Name: Transform & Vector Calculus

L	T	P	Credit
3	0	0	3

Course Objective:

- To perceive the transform techniques in engineering problems
- To expose the concept of Fourier series and Fourier Transform
- To understand Wavelet transform & Z-Transform
- To explore the Vector Calculus

SYLLABUS

Unit 1: Laplace Transform:

Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem. Applications: solving Initial value problems by Laplace Transform method.

Unit 2: Fourier Transforms:

Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform.

Unit 3: Z- Transform & Difference Equations:

Introduction to Z- transform, Properties of the Z-Transform, Inverse Z-Transform, Convolution, Partial Fraction Method, Residual Method and Solving Linear Difference Equation Using Z-Transform.

Unit 4: Vector Differentiation:

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

Unit 5: Vector Integration:

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

Recommended Books

1. B. S. Grewal: Higher Engineering Mathematics, Khanna Publisher, 43 rd Edition, 2015.
2. G. Shanker Rao: Mathematical Methods, I. K. International Publications, 1st Edition, 2009.
3. J.C. Goswami and A.K. Chan: Fundamentals of Wavelets: Theory, Algorithms, and Applications, 2nd ed., Wiley, 2011.
4. Michel Misiti, Yves Misiti, Georges Oppenheim, Jean Michel Poggi: Wavelets and their Applications, John Wiley & Sons, 2010.

5. Ian N. Sneddon: Fourier Transforms, Dover Publications, 2010.
6. Loknath Debnath: Integral Transforms and their applications, Chapman and Hall/CRC, 2nd edition, 2006.

Course Outcomes

Upon completion of the course, a student will be able to

CO1: **Identify** the concepts of Fourier series and Fourier transform

CO2: **Describe** Laplace Transform

CO3: **Illustrate** the problems of Z- transform & Difference Equations

CO4: **Evaluate** vector Differentiation

CO5: **Use** and application of vector Integration

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11242102

Course Name: Data Structures

L	T	P	Credit
2	1	0	3

Course Objective:

- To familiar the students with the use of data structures as the foundational base for computer solutions to problems.
- To understand various techniques of searching and sorting.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

SYLLABUS

Unit I: Introduction to Data Structures: Algorithms & their Characteristics, Asymptotic Notations and complexity analysis, **Array**: Representations of Array, Index to Address Translation, **Linked List**: Introduction, Implementation of Linked List, Operations, and types.

Unit II: Stack: Concepts and implementation of Stacks, Operations on Stack, and Applications of Stack - Conversion of Infix to Postfix Notation, Evaluation of Postfix Expression, and Recursion.

Queue: Concepts and Implementation, Operations on Queues, Dequeue, Priority Queues, Circular Queues.

Unit III: Trees: Types, Terminology, Binary Tree -Representations, Traversal, Threaded Binary Tree, Binary Search Tree, Height Balanced Tree-AVL Tree.

Graph: Terminologies, Representation of Graphs- Sequential & Linked Representation, Graph Traversals- BFS, DFS, Spanning Trees.

Unit IV: Searching: Linear Search, Binary Search, Hashing and Collision Resolution Techniques; Sorting: Bubble Sort, Selection Sort, Insertion Sort.

Unit V: Introduction to Advanced Data Structures, Real-world Applications (Big Data, AI, Cloud Computing, etc.), Hashing for Large-Scale Systems, Graph-Based Data Structures in Industry, Introduction to Concurrent and Distributed Data Structures etc.

Recommended Books

1. Data Structures, Algorithms and Applications in C++, Sartaj Sahni, 2nd Edition.
2. An Introduction to Data Structures with Applications, Jean-Paul Tremblay, McGraw hill.
3. Data Structures & Algorithms, Aho, Hopcroft & Ullman, original edition, Pearson Publication.

Course Outcomes

Upon completion of the course, a student will be able to

CO1: Analyze algorithms using asymptotic notations and perform operations on arrays and linked lists.

CO2: Construct stacks and queues and use them to solve real world problems.

CO3: Distinguish between different types of trees and apply graph theory concepts.

CO4: Compare various searching, sorting and hashing techniques.

CO5: Discover the applications of data structure in emerging areas and real world.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11242103

Course Name: Fluid Mechanics - II

L	T	P	Credit
2	1	0	3

Course Objective:

To develop a comprehensive understanding of fluid flow patterns, turbulent flow behavior, boundary layer concepts, forces on submerged bodies, open channel hydraulics, hydraulic jump characteristics and hydraulic machinery, while introducing computational tools like ANSYS Fluent and HEC-RAS for simulating real-world fluid flow and hydraulic problems.

SYLLABUS

Unit-I

Turbulent Flow: Characteristics of turbulent flow, shear stress due to turbulence, Reynolds stresses, Prandtl's mixing length theory, universal velocity distribution laws, Nikuradse's experiment, Karman–Prandtl resistance equation, variation of friction factor with Reynold's number–Moody's chart.

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), Water hammer**.**

Unit-II

Boundary layer theory: Concept of boundary layer for laminar and turbulent fluid flow, boundary layer growth over a flat plate, boundary layer thickness, displacement thickness, momentum thickness and energy thickness, separation of boundary layer and its control.

Flow around submerged 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: Introduction to Open channel flow, classification and characteristics of open channel flow. 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.

Gradually varied flow: Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles,

Unit-IV

Rapidly varied flow: Hydraulic jump in rectangular channels and its basic characteristics, Surges in open channels.

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

Unit-V

Computational Fluid Dynamics (CFD): Introduction to CFD and its importance in industry and research, Governing Equations, Application of CFD in analyzing turbulent flow, pipe flow, and flow over bodies. Hands-on Tool: ANSYS Fluent

Introduction to River, Stormwater Drainage, and Urban Drainage systems, Hydraulic modelling of Stormwater Drainage, and Urban Drainage systems, Hands-on Tool: SWMM/HEC-RAS.

Text book

1. P.N. Modi & S.M. Seth, Hydraulics and Fluid Mechanics Including Hydraulics Machines, 23rd Edition, Standard Book house, Delhi, 2019.
2. K. Subramanya, Flow in Open Chanels, 5th Edition, Tata McGraw Hill, New Delhi, 2019.
3. Yunus A. Cengel, John M. Cimbala, Fluid Mechanics: Fundamentals and Applications, 4th Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2019.

Reference books

1. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, 10th Edition, Laxmi Publications, New Delhi, 2019.
2. Rangaraju, Flow through Open Channels, 1 st Edition, McGraw Hill Education, New Delhi, 2001.
3. A.K. Jain, Fluid Mechanics including Hydraulic Machines, 12 th Edition, Khanna Publishers, Delhi, 2024.

Course Outcomes

Upon completion of the course, a student will be able to

CO1: Explain the characteristics of turbulent flow and pipe flow losses using classical theories.

CO2: Analyze boundary layer growth and flow around submerged bodies to determine drag and lift forces.

CO3: Apply principles of uniform and gradually varied flow to compute open channel profiles.

CO4: Evaluate performance of turbines and pumps using characteristic curves and similarity laws.

CO5: Utilize CFD tools like ANSYS Fluent and HEC-RAS to simulate fluid flow and hydraulic systems.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11242104

Course Name: Geotechnical Engineering – I

L	T	P	Credit
2	1	0	3

Course Objective:

To familiarize students with fundamental soil properties and classifications. It also aims to develop an understanding of the relationships between physical and mechanical properties of soils, the role of water in soil behavior, shear parameters, stress changes due to foundation loads, and smart and sustainable ground improvement methods.

SYLLABUS

Unit-I Soil properties and Compaction of Soil

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 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.

Introduction to soil compaction, Laboratory Tests, Factors affecting compaction, Structure and engineering behaviour of compacted cohesive soil, Compaction in field.

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, factors affecting permeability of soil.

Seepage analysis: 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, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, final settlement of soil deposits.

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, computation of effective shear strength parameters, unconfined compression test, vane shear test, critical void ratio.

Unit – V Sustainable and Smart Geotechnical Engineering

Introduction to types of ground improvement methods; Bio-geotechnics for soil strengthening, erosion control, and permeability reduction; Impact of climate change on soil behavior.

Courses Outcomes

Upon completion of the course, a student will be able to

CO1: Evaluate different properties of soil and its classification based on these properties.

CO2: Explain 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: Apply the emerging sustainable practices in modern geotechnical engineering to propose environment friendly solutions for ground related problems.

Text Books

1. Soil Mech. & Found. Engg., Dr. K.R. Arora, Std. Publishers Delhi, 7th Edition, 2014
2. Soil Mech. & Foundation, Dr. B.C. Punmia, Laxmi Publications, Delhi, 16th Edition, 2017
3. Basic & Applied Soil Mechanics, Gopal Ranjan, New Age International Publishers, 2016
4. Text Book of Soil Mechanics and Foundation Engineering, V.N.S. Murthy, CBS Publishers, 2007

Reference Books

1. Principles of Geotechnical Engineering. B.M. Das, Cengage Learning Massachusetts, 9th Edition, 2017
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

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11242105

Course Name: Structural Analysis – I

L	T	P	Credit
2	1	0	3

Course Objective:

To develop the ability to analyze structural behavior under various loading conditions by determining deflections in determinate beams, applying energy methods and the principle of virtual work, constructing influence line diagrams, analyzing indeterminate structures using classical methods, and understanding the fundamentals of earthquake-resistant design with reference to relevant IS codes.

SYLLABUS

Unit-I

Deflection of Determinate Beams: Double Integration Method, Macaulay's method, Area Moment Method and Conjugate Beam Method.

Energy Principles and Virtual Work: Energy Method, Castigliano's Theorem, Unit Load Method, Maxwell's Reciprocal Theorems, Principal of Virtual Work, Application to Beams and Pin Jointed Frames.

Unit-II

Rolling Load and Influence Lines: Influence Lines for Determinate Beams, Trusses and Three Hinged Arches; Rolling Load; Use of Influence Line Diagram.

Unit-III

Indeterminate Structures-I: Static and Kinematic indeterminacy; Analysis of Fixed Beam and Continuous Beam by Theorem of Three Moments, Effect of Sinking and Rotation of Supports; Eddy's Theorem, Three Hinged Arches of Different Shapes, Two Hinged and Fixed Arches. Analysis of statically indeterminate trusses.

Unit-IV

Indeterminate Structures-II: Analysis of Beams and Frames (without and with Sway) by Slope Deflection Method and Moment Distribution Method.

Unit-V

Earthquake-Resistant Analysis and Design Trends: Basics of seismic analysis methods: Recent codal developments in IS 1893, IS 13920. Response spectrum and time history, Use of software in analyzing earthquake loads.

Courses Outcomes

Upon completion of the course, a student will be able to

CO1: Apply classical methods like Double Integration, Macaulay's, Area Moment, and Conjugate Beam to compute deflections in beams and trusses.

CO2: Analyze the structural behavior under moving loads using Influence Line Diagrams for beams, trusses, and arches.

CO3: Evaluate the forces and moments in statically indeterminate structures using the Three Moment Theorem, Eddy's Theorem, and related techniques.

CO4: Solve indeterminate structures using Slope Deflection and Moment Distribution methods, including cases with sway.

CO5: Demonstrate basic understanding of seismic design principles and use analysis software to simulate earthquake load response as per IS codes.

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, 6thedition, 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

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11242111
Course Name: Cyber Security

L	T	P	Credit
2	0	0	GRADE

Course Objectives:

To provide students with foundational and advanced knowledge of cyber security principles, threats, and protection mechanisms, while enabling them to apply security practices in systems, applications, and civil engineering infrastructure contexts.

Course Content:

Unit I:

Introduction to Cyber Security: Overview of Cyber Security, Goals of Cyber Security (Confidentiality, Integrity, Availability), Types of cyber-attacks: Phishing, Malware, Ransomware, Social Engineering, Malicious Software's. Hacker and its types. Real-world incidents and their impact, Cyber Ethics and Legal Aspects. Basics of Networking: Internetworking devices, Topologies OSI and TCP/IP models, IP address, DNS, TCP, IP, HTTP, HTTPS, Web Browser, Web Server.

Unit II:

Security Mechanisms: Firewalls, Anti-virus, Intrusion Detection Systems (IDS), Intrusion Prevention Systems (IPS), Encryption and Decryption: Symmetric and Asymmetric, Cryptanalysis, Digital Signature, Authentication: Passwords, Biometrics, Multi-Factor Authentication.

Unit III:

System and Application Security: Operating System security basics. Securing mobile devices and apps. Web application vulnerabilities: SQL Injection, XSS, CSRF. Secure coding practices. Cybercrime, Forensics, and Incident Response: Types of cybercrimes: Identity Theft, Financial Fraud, and Cyberbullying. Basics of digital forensics. Cyber law and IT Act (India) overview. Incident response lifecycle and reporting.

Unit IV:

Cyber Hygiene and Best Practices: Cyber hygiene: Safe browsing, regular updates, backups. Strong password creation and management. Social media safety. Roles of individuals and organizations in ensuring security.

Unit V: Cyber Security in Civil Engineering Applications

Cyber threats to Smart Cities, SCADA Systems, and IoT-based monitoring in bridges, dams, and transport systems. Cybersecurity risks in cloud-based Building Information Modeling (BIM) platforms, Vulnerabilities in sensor networks, autonomous construction equipment, and AI-based site monitoring. Protection of early warning systems and critical infrastructure recovery tools. Case studies of high-profile cyber incidents in infrastructure sectors, BIM-specific cyber security compliance standards.

Recommended Books:

1. Cybersecurity for Beginners by Raef Meeuwisse – Wiley
2. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives; by Nina Godbole and Sunit Belapure – Wiley India
3. Computer Security: Principles and Practice; by William Stallings and Lawrie Brown – Pearson
4. Introduction to Cyber Security; by Chwan-Hwa (John) Wu and J. David Irwin – CRC Press
5. Cyber security Essentials; by Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short – Wiley

Course Outcomes: At the end of the course student will be able to

CO1. Describe fundamental concepts of cyber security, networking concepts and identify common cyber threats and legal implications.

CO2. Demonstrate common security mechanisms used to protect digital data.

CO3. Analyze cybercrime scenarios and vulnerabilities in systems, and outline procedures for incident response and digital forensics.

CO4. Formulate cyber hygiene strategies and practice safe online behavior to minimize cyber risks.

CO5. Analyze cybersecurity threats and vulnerabilities in smart infrastructure, BIM platforms, and IoT-based civil engineering systems to ensure the protection of critical infrastructure.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11242106

Course Name: Fluid Mechanics Lab

L	T	P	Credit
0	0	2	1

LIST OF EXPERIMENT'S

1. Determination of coefficient of discharge for given Circular Orifice and Mouthpiece
2. Determination of coefficient of discharge for given Notches (Rectangular & V-Notch)
3. Determination of coefficient of discharge for given Venturi meter and Orifice meter
4. Determination of viscosity of fluid by redwood viscometer
5. Verification of Bernoulli's Theorem
6. Determination of Friction Factor in Pipes
7. Study of Laminar and Turbulent Flow (Reynolds Apparatus)
8. Estimate the forces caused due to impact of jet on given vanes.
9. Determination of performance characteristics of Francis Turbine
10. Determination of performance characteristics of Pelton Wheel Turbine
11. Determination of performance characteristics of Centrifugal Pump.
12. CFD Simulation of Pipe Flow/ Open Channel Flow using ANSYS Fluent.
13. Urban Drainage System Simulation using EPA SWMM.
14. River Floodplain Modelling using HEC-RAS (1D or 2D).

Course Outcomes:

Upon completion of the course, a student will be able to

CO1: Determine discharge coefficients for various flow measuring devices.

CO2: Evaluate fluid properties and flow regimes experimentally.

CO3: Examine the energy losses in pipelines and validate head loss concepts in fluid systems.

CO4: Analyze the working and performance of hydraulic machines like pumps and turbines.

CO5: Simulate fluid flow and drainage systems using CFD tools.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11242107

Course Name: Survey Practice Lab

L	T	P	Credit
0	0	2	1

LIST OF EXPERIMENT'S

1. Measurement of distance using chain & tape of given survey area.
2. Measurement of direction by prismatic compass & surveyor's compass.
3. Exercise of flying levelling by dumpy level.
4. Profile Levelling & Cross Sectioning of Road using dumpy level.
5. Prepare Contour map by using level or theodolite.
6. Determination of horizontal & vertical position of a point by Total Station & measurement of area.
7. Traversing by Total Station.
8. Measurement of horizontal and vertical angle using Total Station.
9. Preparation of map of given survey field by Radiation and intersection method using Plane table.
10. Resection by Two point problem & Three point problem.
11. Observations using GPS
12. To find out elevations of various points on the ground using auto-level by profile leveling

Course Outcomes:

Upon completion of the course, a student will be able to

CO 1: Measure distances, directions and angles using basic and advanced surveying instruments.

CO 2: Conduct levelling operations to determine ground elevation using dumpy level and auto level.

CO 3: Create contour maps and traverse plans using dumpy level, theodolite and total station.

CO 4: Compute and interpret horizontal and vertical position, coordinates, elevation and areas from field measurements using total station and GPS.

CO 5: Construct survey maps using plane table methods including radiation, intersection and resection techniques.

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. Surveying Volume –II, S. K. Duggal, McGraw Hill Publication, 2015

3. Surveying Vol. I & II, K.R. Arora, Standard book House, New Delhi, 13th edition 2016

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11242109

Course Name: Macro Project – I

L	T	P	Credit
0	0	2	1

LIST OF MACRO PROJECTS (Fluid Mechanics)

1. Design a Rectangular/Open Channel for a Given Discharge Using Manning's Formula (Excel).
2. Create a Physical Model to Demonstrate Uniform vs Non-Uniform Flow Using Water Trough.
3. Plot and Analyze Flow Profiles (GVF, RVF) for Channels Using Python/Excel Solver.
4. Develop a Simple App (Using Python/Excel) to Calculate Flow Rate Using Chezy's and Manning's Equations.
5. Design a Small Irrigation Channel Layout for an Agricultural Field (Paper + AutoCAD Optional)
6. Model Hydraulic Jump Formation Using a Flume (or Household Setup) and Compare with Theory.
7. Numerical Simulation of Gradually Varied Flow in a Mild Sloped Channel Using Excel.
8. Estimate Backwater Curve Due to a Gate/Weir Using Step Method (Excel/Python).
9. Prepare a Mini Report on Sediment Transport Phenomena in a Nearby River (Survey + Theoretical).
10. Study Energy Losses in Channels Due to Bends and Slopes Using Scaled Physical Models.
11. Measure Flow Rate Using Notches and Compare with Theoretical Results.
12. Create a Comparison Table of Real-Time Hydraulic Machines (Pump/Turbine) and Their Efficiency (Survey-Based).
13. Analyze Performance Curves of Centrifugal Pump from Lab Experiment and Plot Using Excel.
14. Design a Rainwater Channel for Your College Campus Using Uniform Flow Assumptions.
15. Develop a Flow Estimation Toolkit (Excel Sheet) with Inputs like Slope, Roughness, Geometry.

Course Outcomes:

The students will be able to:

CO1: Interpret fundamental concepts of open channel flow and flow types.

CO2: Apply uniform and non-uniform flow equations to solve open channel flow problems.

CO3: Analyze gradually and rapidly varied flow using analytical and numerical methods.

CO4: Evaluate hydraulic structures or setups through lab and project-based experimentation.

CO5: Design and simulate flow systems using basic software tools like Excel/Python for real-world applications.

CO-PO Matrix

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

CO3	3	2	2	3	2	1	-	-	1	2	-	2	-	2
CO4	3	2	2	3	2	1	1	1	2	2	1	3	2	2
CO5	3	2	3	3	3	-	1	1	2	2	1	3	-	2

1 - Slightly; 2 - Moderately; 3 – Substantially

LIST OF MACRO PROJECTS (Geotechnical Engineering)

1. Conduct a soil classification and index property analysis of a local site (e.g., college campus or nearby plot).
2. Perform vane shear or unconfined compressive strength tests at different moisture contents, analyze trends and suggest practical implications.
3. Permeability Testing of Different Soils - Compare sandy vs silty vs clayey soils and Discuss implications for seepage and drainage design.
4. Comparison of IS Code vs. Other International Standards for Soil Testing - Pick various tests (e.g., compaction, permeability) and compare the testing procedures.
5. Comparison of Soil Strength using Cement, Lime, and GGBS - Lab comparison of strength gain and environmental impact.
6. Stabilization of Expansive Soil with Waste Materials - Use additives like fly ash, rice husk ash, or lime. Measure improvement in CBR or UCS.
7. Use of Natural Fibers (Coconut Coir, Jute) in Soil Reinforcement - Mix fiber into soil and do a simple shear strength test.
8. Effect of Compaction Effort on Soil Properties - Use different hammer weights or drop heights to see compaction effects.
9. Soil Classification Using Field Identification Methods - Use IS classification system based on texture, color, dry strength, and ribbon test.
10. Comparison of Consolidation Behaviour of Clay vs Silt - Use oedometer tests or simple jar-settlement tests to compare settlement over time.
11. Effect of Soil Type on Shear Strength - Compare shear strength parameters (cohesion and friction angle) for clay, silt, and sand.
12. Strain Rate Effect on Shear Strength - Perform shear tests at different strain rates (fast vs slow) and compare strength behavior.

Course Outcomes:

The students will be able to:

CO1 **Apply** various codal provisions for conducting laboratory tests of geotechnical engineering and classification of soil.

CO2 **Apply** the laboratory tests of Geotechnical Engineering in practical problems.

CO3 **Analyze** the properties and performance of various soil types.

CO4 **Analyze** the effectiveness of different ground improvement techniques.

CO-PO Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

LIST OF MACRO PROJECTS (Structural Analysis)

1. Determine the deflection of a simply supported beam for different loadings.
2. Determine the deflection of a cantilever beam for different loadings.
3. Analyse the continuous beam using three moment method.
4. Analyse the three hinged arch of different shapes.
5. Analyse the portal frame using the slope deflection method.
6. Analyse the portal frame using the moment distribution method.
7. Determine the deflection in a determinate pin-jointed frame using the energy method.
8. Analyse the indeterminate pin-jointed frame using the energy method.
9. Draw the influence line diagram for a simply supported beam.
10. Draw the influence line diagram for a determinate truss.

Course Outcomes:

The students will be able to:

CO1: **Determine** the deflection for determinate beam and pin-jointed frame.

CO2: **Analyse** the continuous beam and portal frame using the classical method.

CO3: **Analyze** the indeterminate truss frame using the energy method.

CO4: **Draw** an influence line diagram for determinate beam and truss

CO-PO Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Course Code: 11242110
Course Name: Self Learning / Presentation

L	T	P	Credit
0	0	2	1

Course Objectives: To encourage students to engage with civil engineering literature, enhance their presentation and communication skills, promote lifelong learning, and develop the soft skills necessary for effective topic presentation.

Syllabus:

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 student will be able to:

CO1: Analyze contemporary issues in civil engineering & its allied areas through literature survey.

CO2: Demonstrate good oral & written communication skills.

CO3: Develop poster and power point presentations for effective communication.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially