PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University)
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Criterion 1 – Curricular Aspects

Key Indicator	1.1	Curriculum Design and Development
Metric	1.1.2	Percentage of Programmes where syllabus revision was carried out during 2021-22

DEPARTMENT OF CIVIL ENGINEERING

S. No.	Programme Code	Programme name	Year of Introduction	Year of revision	Percentage of Syllabus content added or replaced
1	011	B.Tech (Civil Engineering)(Full Time)	1989-90	2021	44.2%
2	601	B.Tech (Civil Engineering)(Part Time)	2008-09	2021	53.5%

S.No	Contents
1	Minutes of Board of Studies
2	Extracts of minutes of the Academic Council Meeting
3	Curicullum and Syllabus of the programme – Before Revision
4	Curicullum and Syllabus of the programme – After Revision

Legend : Font color – Red – Indicates courses (or part-of) which are removed from syllabus before revision

Font color – Green – Indicates courses (or part-of) which are added to syllabus after revision

1. Minutes of Board of Studies

Department of Civil Engineering

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India
Phone +91 - 4362 - 264600 **Fax** +91 - 4362 - 264660
Email : headce@pmu.edu **Web** : www.pmu.edu

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BOARD OF STUDIES MEETING

For B.Tech. CIVIL ENGINEERING (FULL TIME and PART TIME) PROGRAMMES

Minutes of Meeting

Date: 07.8.2021 **Time: 10.00AM** **Venue: Smart Class Room**

Mode of Meeting: Google meet **Meeting Link:** https://meet.google.com/ytp-dkxc-oha

The Board of Studies meeting was held in virtual mode on 07.08.2021 for framing the B.Tech. Civil Engineering (Full Time) Curriculum and syllabi (I to VIII semester) of Regulation 2021 and B.Tech. Civil Engineering (Part Time) Curriculum and syllabi (I to VII semester) of Regulation 2021

Agenda:

1. Implementation of actions on feedback on curricular aspects from stake holders for Regulation 2021.
2. Presentation of Curriculum and Syllabi for B.Tech. Civil Engineering (Full Time and Part time) for Regulation 2021.
3. Discussion on programme articulation matrix (PO coverage by all COs).
4. Discussion on attainment of outcomes (PO, CO).
5. Presentation of new Value-Added Courses.
6. Discussions on Open Electives offered by Department of Civil Engineering to other departments.

Members present:

Table I Members of the BoS

Sl.No.	Name	Designation	Representing
1	Dr.V.A.Shanmugavelu	Associate Professor & Head Department of Civil Engineering, Periyar Maniammai Institute of Science and Technology.	Chair person
2	Dr.G.Ramakrishna	Professor, Department of Civil Engineering Pondicherry Engineering College, Puducherry	Member (Academic Expert)

3	Dr.P.Mariappan	Assistant Executive Engineer, TamilNadu Water Supply and Drainage Board, Chepauk, Chennai, Tamil Nadu 600005	Member (Industry Representation)
4	Thiru.Amarnath Ramanathan	Manager HR – Professional Services INFINITY PMC SOLUTIONS PVT LTD.,Chennai	Special Invitee
5	Dr.Rajakumara HN,	Professor and Head of Civil Engineering, BMS Institute of Technology & Management, Bengaluru - 560064	Special Invitee
6	Dr.Karthikeyan Kathiresan	Chairman, Wasmanpro Environmental Solutions LLP Alandur Chennai	Special Invitee
7	Dr.S.Senthamilkumar	Dean FET Professor, Department of Civil Engineering, Periyar Maniammai Institute of Science and Technology.	Member
8	Dr.R.Jayanthi	Professor, Department of Civil Engineering, Periyar Maniammai Institute of Science and Technology.	Member
9	Dr.S.Suppiah	Professor (Adjunct) Dept. of Civil Engg., PMIST	Member
10	Dr.B.Anupriya	Associate Professor. Dept. of Civil Engg., PMIST	Member
11	Ms.P.Latha	Assistant Professor Dept. of Civil Engg.,PMIST	Member
12	Mr.G.Thirumalmurugan	Assistant Professor Dept. of Civil Engg.,PMIST	Member

A. FEEDBACK ON CURICULLAR ASPECTS

The feedback were collected and analyzed during 2018-19, 2019-20 and 2020-21 from the following stake holders

1. Teachers
2. Employers
3. Alumni students
4. Students

In addition the feedback from Academic Expert, Industry Expert, Teachers, Alumni and students who participated in Department Advisory Committee Meeting (**DAC**) were presented. The action taken for the feedbacks are given as "Remarks" column in the point "B"

B. CURICULLUM INTERVENTION BASED ON CO ATTAINMENT

The CO attainment and PO attainment for the courses were presented to the members. The courses whose CO attainment was consistently below the target values were discussed. Syllabus were modified for those courses and documented in the Table II.

C. PRESENTATION OF CURICULLUM AND SYLLABUS

All the courses which are framed by the department of Civil Engineering are presented individually. The deletion, addition and introduction of new courses related details are tabulated for all courses in the following table.

Table II a: Discussions on courses with actions as remarks **FULL TIME**

S.No	Sem	Course Name	Course content Deletion/ Addition/New	Percentage of change	Remarks
1	I	Calculus and Linear Algebra	Course designed by Mathematics department	No change	
2	I	Electrical and Electronic Engineering Systems	Course designed by EEE department	Revision 10%	Feedback given by Faculty
3	I	Physics	Course designed by Physics department	No Change	
4	I	Engineering Graphics and Design	Course designed by Mechanical Department	No Change	
5	I	Speech Communication	Course designed by English department (Added as New Course)	100%	Feedback given by students, Alumni and Faculty
6	I	Constitution of India	Course designed by Political Science department	No change	University Mandatory Course
7	I	Electrical and Electronic Engineering Systems Lab	Course designed by EEE department	No change	
8	I	Physics Lab	Course designed by Physics department	No change	
9	II	Calculus, Ordinary Differential Equations and Complex Variable	Course designed by Mathematics department	No change	
10	II	Programming for Problem Solving	Course designed by CSE department	No change	
11	II	Chemistry	Course designed by Chemistry department	No change	
12	II	Technical Communication	Course designed by English department Added as New course	100%	Feedback given by students, Alumni and Faculty
13	II	Workshop Practices	Course designed by Mechanical department	No change	
14	II	Engineering Mechanics	Course designed by Civil department	No change	
15	II	Programming for Problem Solving Lab	Course designed by CSE department	10%	Feedback given by teachers
16	II	Chemistry Lab	Course designed by Chemistry department	No Change	
17	III	Transforms and Partial Differential Equations	Course designed by Mathematics department	No Change	

18	III	Mechanics of Solids-I	Mechanics of Solids is split into two separate courses.	20%	Feedback given by teachers and Alumni
19	III	Fluid Mechanics and Machinery	Mechanics of Fluids & Hydraulic Engineering is combined together	30%	Feedback given by teachers, student and Alumni
20	III	Building Materials and Construction	Added as a New Course	100%	Feedback given by students, Alumni and Faculty
21	III	Surveying – I	-	No Change	-
22	III	Entrepreneurship Development	Course designed by Department of Management studies (Added as a New Course)	70%	Feedback given by students, Alumni and Faculty
23	III	Universal Human Values 2: Understanding Harmony and gender	Added as a New Course	100%	University Mandatory course
24	III	Strength of Materials Lab	Theory cum Lab paper is separated and Lab is framed separately. Added as new course	50%	Feedback given by students, Alumni and Faculty
25	III	Fluid Mechanics and Machinery Lab	List of Experiments of Mechanics of Fluids & Hydraulic Engineering is combined together.	10%	Feedback given by students
26	III	In-plant Training-I	-	-	-
27	IV	Probability and Statistics	Course designed by department of Mathematics (Added as a New Course)	100%	Feedback given by students, Alumni and Faculty
28	IV	Mechanics of Solids-II	Added as new course. Three units new topics were included.	70%	Feedback given by students, Alumni and Faculty
29	IV	Surveying – II	-	No Change	
30	IV	Geotechnical Engineering-I	-	No Change	
31	IV	Concrete Technology	Few topics were reduced from 2018 regulation	15 %	Feedback given by Alumni
32	IV	Economics for Engineers	Course designed by Department of Management studies	No change	-
33	IV	Disaster Management	Course designed by Department of Civil	10%	Feedback given by Alumni
34	IV	Computer Aided Civil Engineering Drawing	-	No change	-
35	IV	Surveying Lab	The experiments covered in Surveying I & II of Regulation 2018	10 %	Feedback given by Alumni

			was combined as single laboratory.		
36	IV	Geotechnical Engg. Lab	Two experiments were added in new curriculum	5%	Feedback given by faculty
37	V	Structural Analysis	-	No change	
38	V	Transportation Engineering	New chapters such as Railways, Airport, Docks and Harbours were included in the new curriculum.	90%	Feedback given by students, Alumni and Faculty
39	V	Environmental Engineering	Deleted the practical from 2018 Regulation. Two topics were added in Unit III	5%	Feedback given by Alumni
40	V	Geotechnical Engineering - II	Three new chapters were included in the new curriculum	70%	Feedback given by students, Alumni and Faculty
41	V	Professional Elective Course-I	-	-	-
42	V	Open Elective Course – I	-	-	-
43	V	Environmental Engineering Lab	Included the practicals from 2018 Regulation.	No change	
44	V	Concrete & Highway Lab	Six experiments were included in the new curriculum	60%	Feedback given by students, Alumni and Faculty
45	V	In-Plant Training – II	-	-	-
46	VI	Design of RCC Structures	Few topic included in first unit	5%	Feedback given by Faculty
47	VI	Design of Steel Structures	Framed as new course	100%	Feedback given by students, Alumni and Faculty
48	VI	Construction Engineering and Management	Deleted some of the topics in unit II,III and IV	5%	Feedback given by Faculty
49	VI	Professional Elective Course-II	-	-	-
50	VI	Open Elective Course – II	-	-	-
51	VI	Professional Skills	Course designed by Department of English (Added as a New Course)	100%	Feedback given by students, Alumni and Faculty
52	VI	Cyber Security	Course designed by Department of CSE	25%	Feedback given by students, Alumni and Faculty
53	VI	Construction Management Lab		No change	
54	VI	Survey Camp	-	No change	-
55	VII	Finite Element Method	Framed as new course	100%	Feedback given by students, Alumni and Faculty
56	VII	Professional Elective Course-	-	-	-

		III			
57	VII	Open Elective Course – III	-	-	-
58	VII	Environmental Studies	Course designed by Department of Civil	10%	Feedback given by Faculty
59	VII	Computer Aided Design & Drafting	Added as new course	100%	Feedback given by students, Alumni and Faculty
60	VII	Estimation, Costing and valuation	-	No Change	-
61	VII	Project Work (Phase-I)	-	-	-
62	VII	In-Plant Training- III	-	-	-
63	VIII	Professional Elective Course-IV	-	-	-
64	VIII	Open Elective Course –IV	-	-	-
65	VIII	Open Elective Course – V	-	-	-
66	VIII	Project Work (Phase-II)	-	-	-
	PROFESSIONAL ELECTIVE COURSE I				
67	V	Smart Structures and Materials	Added as New Course	100%	Feedback given by students, Alumni and Faculty
68	V	GIS for Civil Engineering	Added as New Course	100%	Feedback given by students, Alumni and Faculty
69	V	Water Quality Engineering	-	No change	
70	V	Pavement Design	-	No change	
71	V	Construction Equipment and Automation	-	No change	
72	V	Airport Planning and Design	-	No change	
73	V	Port and Harbour Engineering	-	No change	
	PROFESSIONAL ELECTIVE COURSE II				
74	VI	Earthquake Engineering	-	No change	
75	VI	Bridge Engineering	-	No change	
76	VI	Advanced Structural Analysis	-	No change	
77	VI	Basics of Computational Hydraulics	-	No change	
78	VI	Water Resources Engineering	Added as New Course	100%	Feedback given by students, Alumni and Faculty
79	VI	Environmental Geotechnology	-	No change	
80	VI	Geotechnical Design	-	No change	
	PROFESSIONAL ELECTIVE COURSE III				
81	VII	Environmental Fluid Mechanics	-	No change	
82	VII	Environmental Impact Assessment	-	No change	
83	VII	Design of Hydraulic Structures	-	No change	
84	VII	Surface Hydrology	-	No change	
85	VII	Repairs and Rehabilitation of Structures	-	No change	

86	VII	Urban Hydrology and Hydraulics	-	No change	
87	VII	Building Construction Practice	-	No change	
	PROFESSIONAL ELECTIVE COURSE IV				
88	VIII	Tall Structures	Added as New Course	100%	Feedback given by students, Alumni and Faculty
89	VIII	Environmental Law and Policy	-	No change	
90	VIII	Groundwater Engineering	-	No change	
91	VIII	Solid and Hazardous Waste Management	-	No change	
92	VIII	Pre-stressed and Prefabricated Structures	Added as New Course	100%	Feedback given by students, Alumni and Faculty
93	VIII	Contracts Management	-	No change	
94	VIII	Air and Noise Pollution and Control	-	No change	

Table II b: Discussions on courses with actions as remarks **PART TIME**

S.No	Sem	Course Name	Course content Deletion/ Addition/New	Percentage of change	Remarks
1	I	Probability and Statistics	Course designed by department of Mathematics (Added as a New Course)	100%	Feedback given by students, Alumni and Faculty
2	I	Mechanics of Solids-I	Mechanics of Solids is split into two separate courses.	20%	Feedback given by teachers and Alumni
3	I	Fluid Mechanics and Machinery	Mechanics of Fluids & Hydraulic Engineering is combined together	30%	Feedback given by teachers, student and Alumni
4	I	Strength of Materials Lab	Theory cum Lab paper is separated and Lab is framed separately. Added as new course	50%	Feedback given by students, Alumni and Faculty
5	I	Fluid Mechanics and Machinery Lab	List of Experiments of Mechanics of Fluids & Hydraulic Engineering is combined together.	10%	Feedback given by students
6	II	Mechanics of Solids-II	Added as new course. Three units new topics were included.	70%	Feedback given by students, Alumni and Faculty
7	II	Geotechnical Engineering-I	-	No Change	
8	II	Concrete Technology	Few topics were reduced from 2018 regulation	15 %	Feedback given by Alumni
9	II	Disaster Management	Course designed by Department of Civil	10%	Feedback given by Alumni

10	II	Geotechnical Engg. Lab	Two experiments were added in new curriculum	5%	Feedback given by faculty
11	III	Structural Analysis	-	No change	
12	III	Transportation Engineering	New chapters such as Railways, Airport, Docks and Harbours were included in the new curriculum.	90%	Feedback given by students, Alumni and Faculty
13	III	Environmental Engineering	Deleted the practical from 2018 Regulation. Two topics were added in Unit III	5%	Feedback given by Alumni
14	III	Environmental Engineering Lab	Included the practicals from 2018 Regulation.	No change	
15	III	Concrete & Highway Lab	Six experiments were included in the new curriculum	60%	Feedback given by students, Alumni and Faculty
16	IV	Design of RCC Structures	Few topic included in first unit	5%	Feedback given by Faculty
17	IV	Geotechnical Engineering - II	Three new chapters were included in the new curriculum	70%	Feedback given by students, Alumni and Faculty
18	IV	Construction Engineering and Management	Deleted some of the topics in unit II,III and IV	5%	Feedback given by Alumni
19	IV	Professional Elective Course- I	-	-	-
20	IV	Construction Management Lab		No change	
21	V	Design of Steel Structures	Framed as new course	100%	Feedback given by students, Alumni and Faculty
22	V	Professional Elective Course- II	-	-	-
23	V	Environmental Studies	Course designed by Department of Civil	10%	Feedback given by faculty
24	V	Computer Aided Design & Drafting	Added as new course	100%	Feedback given by students, Alumni and Faculty
25	V	Estimation, Costing and valuation	-	No Change	-
26	VI	Professional Elective Course- III	-	-	-
27	VI	Project Work (Phase-I)	-	-	-
28	VII	Professional Elective Course-IV	-	-	-
29	VII	Project Work (Phase-II)	-	-	-
	PROFESSIONAL ELECTIVE COURSE I				
30	V	Smart Structures and Materials	Added as New Course	100%	Feedback given by students, Alumni and Faculty

31	V	GIS for Civil Engineering	Added as New Course	100%	Feedback given by students, Alumni and Faculty
32	V	Water Quality Engineering	-	No change	
33	V	Pavement Design	-	No change	
34	V	Construction Equipment and Automation	-	No change	
35	V	Airport Planning and Design	-	No change	
36	V	Port and Harbour Engineering	-	No change	
	PROFESSIONAL ELECTIVE COURSE II				
37	VI	Earthquake Engineering	-	No change	
38	VI	Bridge Engineering	-	No change	
39	VI	Advanced Structural Analysis	-	No change	
40	VI	Basics of Computational Hydraulics	-	No change	
41	VI	Water Resources Engineering	Added as New Course	100%	Feedback given by students, Alumni and Faculty
42	VI	Environmental Geotechnology	-	No change	
43	VI	Geotechnical Design	-	No change	
	PROFESSIONAL ELECTIVE COURSE III				
44	VII	Environmental Fluid Mechanics	-	No change	
45	VII	Environmental Impact Assessment	-	No change	
46	VII	Design of Hydraulic Structures	-	No change	
47	VII	Surface Hydrology	-	No change	
48	VII	Repairs and Rehabilitation of Structures	-	No change	
49	VII	Urban Hydrology and Hydraulics	-	No change	
50	VII	Building Construction Practice	-	No change	
	PROFESSIONAL ELECTIVE COURSE IV				
51	VIII	Tall Structures	Added as New Course	100%	Feedback given by students, Alumni and Faculty
52	VIII	Environmental Law and Policy	-	No change	
53	VIII	Groundwater Engineering	-	No change	
54	VIII	Solid and Hazardous Waste Management	-	No change	
55	VIII	Pre-stressed and Prefabricated Structures	Added as New Course	100%	Feedback given by students, Alumni and Faculty
56	VIII	Contracts Management	-	No change	
57	VIII	Air and Noise Pollution and Control	-	No change	

D. LIST OF NEWLY INTRODUCED COURSES IN REGULATION 2021

a. FULL TIME

S.No	Name of the course
1	Speech Communication
2	Technical Communication
3	Electrical and Electronics Engineering System Laboratory
4	Transforms and Partial Differential Equations
5	Universal Human Values 2: Understanding Harmony and Gender
6	Building Materials and Construction
7	Strength of Materials Lab
8	Probability and Statistics
9	Disaster Management
10	Mechanics of Solids-II
11	Transportation Engineering
12	Geotechnical Engineering - II
13	Concrete & Highway Lab
14	Professional Skills
15	Design of Steel Structures
16	Finite Element Method
17	Computer Aided Design & Drafting
18	Smart Structures and Materials
19	GIS for Civil Engineering
20	Water Resource Engineering
21	Tall Structures
22	Prestressed and Prefabricated Structures

b. PART TIME

S.No	Name of the course
1	Strength of Materials Lab
2	Probability and Statistics
3	Disaster Management
4	Mechanics of Solids-II
5	Transportation Engineering
6	Geotechnical Engineering - II
7	Concrete & Highway Lab
8	Design of Steel Structures
9	Computer Aided Design & Drafting
10	Smart Structures and Materials
11	GIS for Civil Engineering
12	Water Resource Engineering
13	Tall Structures
14	Prestressed and Prefabricated Structures

E. LIST OF COURSES REMOVED

Table III a: Table of courses removed with remarks **FULL TIME**

S.No	Course Code and Name	Remarks
1	Energy Science and Engineering	Energy related topics were included in the Environmental Studies
2	Introduction to Civil Engineering	Few advanced topics were added and renamed as Building materials and Construction
3	Mechanical Engineering	Not relevant to civil Engineering programmes
4	Engineering Geology	Included in the Building materials and construction course
5	Professional Practice, Law & Ethics	New topics were added and included in the Contract Management Course

Table III b: Table of courses removed with remarks **PART TIME**

S.No	Course Code and Name	Remarks
1	Computer Aided Civil Engineering Drawing	Topics were included in the Computer Aided Design & Drafting
2	Materials Testing & Evaluation	Separated as two labs namely, Strength of materials lab and Concrete & Highway Lab
3	Hydrology & Water Resources Engineering	Included in the Professional Elective Courses
4	Professional Practice, Law & Ethics	New topics were added and included in the Contract Management Course

F. PERCENTAGE CHANGE IN THE SYLLABUS

a. FULL TIME

Number of new courses added = 22 = 54 credits
Number of courses removed =7 = 18 credits
% change = (72/163) x 100 = 44.2 %

b. PART TIME

Number of new courses added = 14 = 36 credits
Number of courses removed =4 = 10 credits
% change = (46/86) x 100 = 53.5 %

G. NOTES ON BENCHMARKING WITH AICTE MODEL CURRICULUM

The AICTE model syllabus was also presented in the BoS. The members compared the designed curriculum and discussed the following

a. The credits of the two curriculum are found to be same in the Full time and One credit is more than the previous curriculum (2018) for Part time.

b. The courses in the AICTE curriculum such as _Design of Concrete structures, Design of Steel structures, Geotechnical Engineering and Transportation Engineering are present in the designed curriculum either as combined course or as part of other courses.
c. The designed curriculum is found to have extra coverage of the programme of study.

H. NOTES ON CREDIT DISTRIBUTION AND COMPARISION WITH AICTE GUIDELINES

Table IV: Credit distribution FULL TIME

AICTE Course Title	I	II	III	IV	V	VI	VII	VIII	PMIST Total	AICTE recommendation	Deviation
HSMC	3	2	2	3		3			13	12	1
BSC	9	9	3	3					24	25	-1
ESC	8	10		0					18	24	-6
PCC			14	15	14	12	6		61	48	13
PEC					3	3	3	3	12	18	-6
OE					3	3	3	6	15	18	-3
PROJ			1		1		6	9	17	15	2
MC	0		3	0		0	0		3	3	0
	20	21	23	21	21	21	18	18	163	163	

I. COURSES ON EMPLOYABILITY/ENTREPRENEURSHIP/SKILL DEVELOPMENT

The curriculum focus of including 94 % of courses with either/and employability / entrepreneurship / skill development. The courses are given below

Table V a: Categorization of courses FULL TIME

Semester	Category	Code	Subject Name	Category
I	BSC	MA-I	Calculus and Linear Algebra	Skill Development
I	ESC	BE	Electrical and Electronic Engineering Systems	Skill Development
I	BSC	P/C	Physics	Skill Development
I	HSMC	SC	Speech Communication	Skill Development
I	ESC	EG	Engineering Graphics and Design	Skill Development
I	MC	UMAN-III	Constitution of India	Skill Development
I	ESC	BEL	Electrical and Electronic Engineering Systems Lab	Skill Development
I	BSC	PL	Physics Lab	Skill Development
II	BSC	MA-II	Calculus, Ordinary Differential Equations and Complex Variable	Skill Development
II	ESC	PPS-T	Programming for Problem Solving	Employability
II	BSC	P/C	Chemistry	Skill Development
II	HSMC	TC	Technical Communication	Skill Development
II	ESC	Works	Workshop	Skill Development

II	ESC	EM	Engineering Mechanics	Skill Development
II	ESC	PPS-L	Programming for Problem Solving Lab	Employability
II	BSC	CL	Chemistry Lab	Skill Development
III	BSC	MA-III	Transforms and Partial Differential Equations	Skill Development
III	PCC	PCC T	Mechanics of Solids-I	Skill Development
III	PCC	PCC-T	Fluid Mechanics and Machinery	Skill Development
III	PCC	PCC-T	Building Materials and Construction	Skill Development
III	PCC	PCC-T	Surveying – I	Skill Development
III	HSMC	MNGT-I	Entrepreneurship Development	Entrepreneurship
III	MC (HSMC)	UMAN-1	Universal Human Values 2: Understanding Harmony and gender	Skill Development
III	PCC	PCC-L	Strength of Materials Lab	Skill Development
III	PCC	PCC-L	Fluid Mechanics and Machinery Lab	Skill Development
III	IPT-1	PROJ	In Plant Training-I	Employability
IV	BSC	MA-IV	Probability and Statistics	Skill Development
IV	PCC	PCC T	Mechanics of Solids-II	Skill Development
IV	PCC	PCC-T	Surveying – II	Employability
IV	PCC	PCC-T	Geotechnical Engineering - I	Skill Development
IV	PCC	PCC-T	Concrete Technology	Skill Development
IV	HSMC	MNGT-II	Economics for Engineers	Skill Development
IV	MC	UMAN-IV	Disaster Management	Skill Development
IV	PCC	PCC-L	Computer Aided Civil Engineering Drawing Lab	Employability
IV	PCC	PCC-L	Surveying Lab	Employability
IV	PCC	PCC-L	Geotechnical Engineering Lab	Skill Development
V	PCC	PCC T	Structural Analysis	Skill Development
V	PCC	PCC-T	Transportation Engineering	Skill Development
V	PCC	PCC-T	Environmental Engineering	Skill Development
V	PCC	PCC-T	Geotechnical Engineering - II	Skill Development
V	PEC	PEC-I	Professional Elective I	Employability
V	OE	OE I	Open Elective Courses-I	*****
V	PCC	PCC-L	Environmental Engineering Lab	Skill Development
V	PCC	PCC-L	Concrete & Highway Lab	Skill Development
V	IPT-II	PROJ	In Plant Training	Employability
VI	PCC	PCC T	Design of RCC Structures	Skill Development
VI	PCC	PCC T	Design of Steel Structures	Skill Development
VI	PCC	PCC-T	Construction Engineering and Management	Skill Development
VI	PEC	PEC-II	Professional Elective II	Employability
VI	OE	OE II	Open Elective Courses-II	*****

VI	HSMC	ELS	English Language Skills	Skill Development
VI	MC	UMAN-V	Cyber Security	Employability
VI	PCC	PCC-L	Construction Management Lab	Skill Development
VI	PCC	PCC-L	Computer Aided Design & Drafting	Employability
VI	PCC	PCC-L	Survey Camp	Skill Development
VII	PCC	PCC-T	Finite Element Method	Skill Development
VII	PEC	PEC-III	Professional Elective III	Employability
VII	OE	OE III	Open Elective Courses-III	*****
VII	MC	UMAN-V	Environmental studies	Skill Development
VII	PCC	PCC-L	Estimation, Costing and valuation	Employability
VII	PROJ	Proj I	Project Work (Phase-I)	Skill Development
VII	PROJ	IPT III	In-plant Training – III	Skill Development
VIII	PEC	PEC-IV	Professional Elective IV	Employability
VIII	OE	OE IV	Open Elective Courses-IV	*****
VIII	OE	OE V	Open Elective Courses-V	*****
VIII	PROJ	PROJ II	Project Work (Phase-II)	Skill Development

Table V b: Categorization of courses PART TIME

Semester	Category	Code	Subject Name	Category
I	BSC	MA-I	Probability and Statistics	Skill Development
I	PCC	PCC T	Mechanics of Solids-I	Skill Development
I	PCC	PCC-T	Fluid Mechanics and Machinery	Skill Development
I	PCC	PCC-L	Strength of Materials Lab	Skill Development
I	PCC	PCC-L	Fluid Mechanics and Machinery Lab	Skill Development
II	PCC	PCC T	Mechanics of Solids-II	Skill Development
II	PCC	PCC-T	Geotechnical Engineering - I	Skill Development
II	PCC	PCC-T	Concrete Technology	Skill Development
II	MC	UMAN-IV	Disaster Management	Skill Development
II	PCC	PCC-L	Geotechnical Engineering Lab	Skill Development
III	PCC	PCC T	Structural Analysis	Skill Development
III	PCC	PCC-T	Transportation Engineering	Skill Development
III	PCC	PCC-T	Environmental Engineering	Skill Development
III	PCC	PCC-L	Environmental Engineering Lab	Skill Development
III	PCC	PCC-L	Concrete & Highway Lab	Skill Development
IV	PCC	PCC T	Design of RCC Structures	Skill Development
IV	PCC	PCC-T	Geotechnical Engineering - II	Skill Development
IV	PCC	PCC-T	Construction Engineering and Management	Skill Development
IV	PEC	PEC-I	Professional Elective I	Employability
IV	PCC	PCC-L	Construction Management Lab	Skill Development

V	PCC	PCC T	Design of Steel Structures	Skill Development
V	PEC	PEC-II	Professional Elective II	Employability
V	MC	UMAN-V	Environmental studies	Skill Development
V	PCC	PCC-L	Computer Aided Design & Drafting	Employability
V	PCC	PCC-L	Estimation, Costing and valuation	Employability
VI	PEC	PEC-III	Professional Elective III	Employability
VI	PROJ	PROJ I	Project Work (Phase-I)	Skill Development
VII	PEC	PEC-IV	Professional Elective IV	Employability
VII	PROJ	PROJ II	Project Work (Phase-II)	Skill Development

J. DISCUSSION ON PROGRAMME ARTICULATION MATRIX (PO COVERAGE BY ALL COS)

The existing POs and PSO was presented. The members agreed that there need not be any changes in the PSO and PO.

FULL TIME:

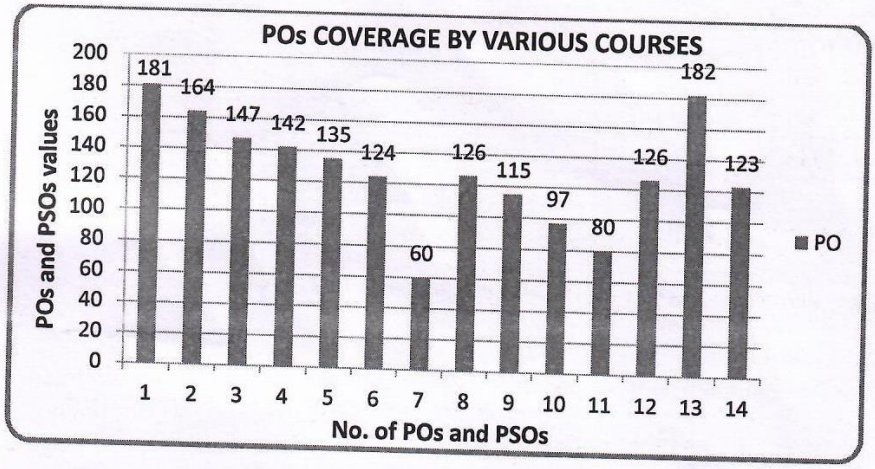

Figure 1 PO coverage by various courses FULL TIME

PART TIME

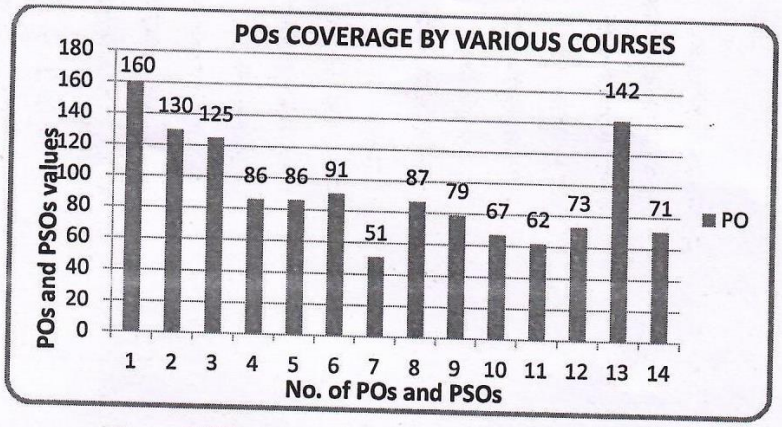

Figure 2 PO coverage by various courses PART TIME

It is found that PO7 which is an understanding of professional Ethical responsibility in a global context was covered by few courses only. Other than that the curriculum covers all POs with small deviations.

K. OPEN ELECTIVE COURSES – OFFERED TO OTHER DEPARTMENT

S.No.	Course Name	Remarks
1	Remote Sensing & GIS	-
2	Building Services	-
3	Non Destructive Testing	Added as New Course
4	Metro Systems and Engineering	Added as New Course

L. VALUE ADDED COURSES PROVIDED

Value added courses with more than 30 hours are given to the students by the department. The value added courses are given in Table VI. The syllabus of the same is given in Appendix A.

Table VI Value added courses- FULL TIME

S.No.	Course Name	Remarks
1.	AutoCAD	Old
2.	SketchUp	Old
3	Revit Architecture	New
4.	Staad.Pro	Old
5.	Primavera	Old
6.	5D BIM	New
7.	IOT in Civil Engineering	New
8.	Drone Surveying	New

The BoS members recommended submitting the outcome of this meeting in the forthcoming Academic council meeting for approval.

HoD/Civil
(Dr.V.A Shanmugavelu)

Dean (FET)
(Dr.S.Senthamil Kumar)

Dean (Academic)
(Dr. P.K Srividhya)

2. Extracts of Minutes of the 38th academic council meeting for Bacheor of Technology in Civil Engineering programme held on 30.09.2021

DEPARTMENT OF CIVIL ENGINEERING

FET Civil 38.3.3 **TO CONSIDER AND APPROVE** the Curriculum and Syllabus for B.Tech – Civil Engineering programme under Full-Time (Regulation 2021).

Notes:

The Board of Studies of the Department of Civil Engineering recommended the Curriculum from I to VIII Semesters and Syllabus from I to VIII Semesters for B.Tech Civil Engineering programme under Full-Time (Regulation 2021).

Curriculum and Syllabus is in line with AICTE guidelines 2020 with 44% revision from previous syllabus. The syllabus revision is based on feedback on curricular aspects from students, teachers, employers and alumni. The syllabus has 94% courses having focus on employability / entrepreneurship /skill development. The complete Curriculum and Syllabus with details are given in the Board of Studies minutes document attached as Annexure. The new courses of Regulations 2021, new value added courses to be offered by department and Open Elective courses offered by the department to other department students are as follows:

New courses:

1. Speech Communication
2. Technical Communication
3. Electrical and Electronics Engineering System Laboratory
4. Transforms and Partial Differential Equations
5. Universal Human Values 2: Understanding Harmony
6. Building Materials and Construction
7. Strength of Materials Lab
8. Probability and Statistics
9. Disaster Management
10. Mechanics of Solids-II
11. Transportation Engineering
12. Geotechnical Engineering - II
13. Concrete & Highway Lab
14. Professional Skills
15. Design of Steel Structures

16. Finite Element Method
17. Computer Aided Design & Drafting
18. Smart Structures and Materials
19. GIS for Civil Engineering
20. Water Resource Engineering
21. Tall Structures
22. Prestressed and Prefabricated Structures

New Value added courses

1. Revit Architecture
2. 5D BIM
3. IOT in Civil Engineering
4. Drone Surveying

Open elective courses

1. Non Destructive Testing
2. Metro Systems and Engineering

The matter is placed before the Academic Council for approval.

Resolution

RESOLVED TO APPROVE the Curriculum and Syllabus for B.Tech – Civil Engineering programme under Full-Time (Regulation 2021).

b.B.Tech Civil Engineering - Part Time

FET Civil 38.3.4

TO CONSIDER AND APPROVE the Curriculum and Syllabus for B.Tech – Civil Engineering programme under Part-Time (Regulation 2021).

Notes:

The Board of Studies of the Department of Civil Engineering recommended the Curriculum from I to VII Semesters and Syllabus from I to VII Semesters for B.Tech Civil Engineering programme under Part-Time (Regulation 2021).

Curriculum and Syllabus is in line with AICTE guidelines 2020 with 54% revision from previous syllabus. The syllabus revision is based on feedback on curricular aspects from students, teachers, employers and alumni. The syllabus has 90% courses having focus on employability/ entrepreneurship/ skill development. The complete Curriculum and Syllabus

with details are given in the Board of Studies minutes document attached as Annexure. The new courses of Regulations 2021 are as follows:

New courses:

1. Strength of Materials Lab
2. Probability and Statistics
3. Disaster Management
4. Mechanics of Solids-II
5. Transportation Engineering
6. Geotechnical Engineering - II
7. Concrete & Highway Lab
8. Design of Steel Structures
9. Computer Aided Design & Drafting
10. Smart Structures and Materials
11. GIS for Civil Engineering
12. Water Resource Engineering
13. Tall Structures
14. Prestressed and Prefabricated Structures

The matter is placed before the Academic Council for approval.

Resolution

RESOLVED TO APPROVE the Curriculum and Syllabus for B.Tech – Civil Engineering programme under Part-Time (Regulation 2021).

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3. Curicullum and Syllabus of the programme – Before Revision

a. Bachelor of Technology in Civil Engineering (Full Time)

SEMESTER I

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
XMA101	BSC	Calculus and Linear Algebra	3	1	0	4
XES102	MAN	Environmental Sciences	2	0	0	0
XBE103	ESC	Electrical and Electronics Engineering Systems	3	1	1	5
XAP104	BSC	Applied Physics for Engineers	3	1	4	6
XEG105	ESC	Engineering Graphics	2	1	0	3
	TOTAL		**13**	**4**	**6**	**18**

SEMESTER II

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
XMA201	BSC	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	4
XCP202	ESC	Programming for Problem Solving	3	0	2	5
XGS203	HSM	English	2	0	1	3
XAC204	BSC	Applied Chemistry for Engineers	3	1	1	5
XWP205	ESC	WorkshopPractices	1	0	2	3
	TOTAL		**12**	**2**	**6**	**20**

SEMESTER III

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
XCE301	BSC	Transforms and Computational Techniques	2	0	0	2
XCE302	PCC	Disaster Preparedness & Planning	1	1	0	2
XCE303	ESC	Computer Aided Civil Engineering Drawing	1	0	3	3
XCE304	ESC	Engineering Mechanics	3	1	0	4
XCE305	ESC	Energy Science and Engineering	1	1	0	2
XCE306	PCC	Surveying – I	2	0	2	3
XCE307	HSM	Introduction to Civil Engineering	3	0	0	3
XGS308	HSM	Effective Technical Communication	3	0	0	3
XCE309		In-plant Training - I	0	0	2	0
XCEM0*		Minor Course - I	1	0	1	0
	TOTAL		**17**	**3**	**8**	**22**

SEMESTER IV

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
XCE401	ESC	Mechanical Engineering	2	1	0	3
XCE402	PCC	Concrete Technology	3	0	0	3
XCE403	PCC	Engineering Geology	1	0	2	2
XCE404	PCC	Mechanics of Fluids	2	0	2	3
XUM405	HSM	Entrepreneurship Development	3	0	0	0
XCE406	PCC	Mechanics of Solids	2	0	2	3
XCE407	PCC	Geotechnical Engineering	2	0	2	3
XCE408	PCC	Surveying – II	2	0	2	3
XCE409	PCC	Materials Testing & Evaluation	2	0	2	3
	TOTAL		**19**	**1**	**12**	**23**

SEMESTER V

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
XCE501	PCC	Mechanics of Materials	3	0	0	3
XCE502	PCC	Hydraulic Engineering	2	0	2	3
XCE503	PCC	Structural Analysis	2	1	0	3
XCE504	PCC	Hydrology & Water Resources Engineering	2	2	0	3
XCE505	PCC	Environmental Engineering	2	0	2	3
XUM506	HSM	Constitution of India	2	0	0	0
XCE507	PCC	Transportation Engineering	2	0	2	3
XCE508	PCC	Construction Engineering & Management	2	1	0	3
XCE509	HSM	Professional Practice, Law & Ethics	2	0	0	2
XCE510		In-plant Training - II	0	0	2	0
XCEM0*		Minor Course – II	1	0	1	0
	TOTAL		**19**	**4**	**9**	**23**

SEMESTER VI

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
XCE601	PCC	Structural Engineering	2	1	0	3
XCE602	PCC	Engineering Economics, Estimation & Costing	2	1	4	5
XCEE**	PEC	Elective-I	3	0	0	3
XCEE**	PEC	Elective-II	3	0	0	3
XCEE**	PEC	Elective-III	3	0	0	3
XCEE**	PEC	Elective-IV	3	0	0	3
	OEC	Open Elective-I	3	0	0	3
	TOTAL		**19**	**2**	**4**	**23**

SEMESTER VII

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
XCEE**	PEC	Elective V	3	0	0	3
XCEE**	PEC	Elective-VI	3	0	0	3
XCEE**	PEC	Elective VII	3	0	0	3
	OEC	Open Elective-II	3	0	0	3
XCE705	Project	Project Phase – I	0	0	8	4
XCE706		In--plant Training - III	0	0	4	2
XCEM0*		Minor Course – III	0	0	0	0
	TOTAL		**12**	**0**	**12**	**18**

SEMESTER VIII

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
XCEE**	PEC	Elective VIII	2	0	0	2
	OE	Open Elective-III	3	0	0	3
	OE	Open Elective-IV	3	0	0	2
XCE804	Project	Project Phase– II	0	0	12	6
	TOTAL		**11**	**0**	**12**	**16**

Semester : **II**

Course Code : **XCE 305**

Course Name : **ENERGY SCIENCE AND ENGINEERING**

Prerequisite :

L	T	P	C
1	1	0	2

C	P	A
1.5	0	1.5

L	T	P	H
3	1	0	4

Course Outcome: After the completion of the course, students will be able to		***Domain C or P or A***	***Level***
CO1	***List*** and generally ***explain*** the main sources of energy and their primary applications nationally and internationally	Cognitive Affective	Understand Respond
CO2	***Understand*** effect of using these sources on the environment and climate	Cognitive	Understand
CO3	***Describe*** the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.	Cognitive	Understand
CO4	***List*** and describe the primary renewable energy resources and technologies.	Cognitive	Understand
CO5	***Quantify*** energy demands and make comparisons among energy uses, resources, and technologies.	Cognitive Affective	Understand Respond
CO6	***Understand*** the Engineering involved in projects utilizing these sources	Cognitive	Understand

COURSE CONTENT

UNIT I **INTRODUCTION TO ENERGY SCIENCE** **4**

Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment

UNIT II **ENERGY SOURCES** **5**

Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

UNIT III **ENERGY AND ENVIRONMENT** **6**

Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and

sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy

UNIT IV CIVIL ENGINEERING PROJECTS 10

Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems

UNIT V ENGINEERINGFOR ENERGY CONSERVATION 5

Concept of Green Building and Green Architecture; Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption

L	T	P	Total
45	15	0	60

TEXT BOOKS

1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press
3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
4. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
5. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley

REFERENCE BOOKS

1. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
2. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	2	1	1	1		1	2	2	1	2	1	2	2
CO 2	3		3	2		1		2	2	1	3	1	2	2
CO 3	3	2	1		2	2	1	3	2	1	1	2	2	**2**
CO 4	2	3	2	1				2	2	1	2	1	2	**2**
CO 5	3	2		2	1	2		1	2	1	1	1	2	**2**

CO6		3	2	1		1	2	1	2	1	2	2	2	**2**
Total	14	12	9	7	4	6	4	11	12	6	11	8	12	**12**
Scaled Value	3	3	2	2	1	2	1	3	3	2	3	2	3	3

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : II

Course Code : XCE 307

Course Name : INTRODUCTION TO CIVIL ENGINEERING

Prerequisite :

L	**T**	**P**	**C**
2	**0**	**0**	**2**

C	**P**	**A**
2	**0**	**0**

L	**T**	**P**	**H**
2	**0**	**0**	**2**

Course Outcome: After the completion of the course, students will be able to		***Domain C or P or A***	***Level***
CO1	Understand the basis of engineering, Building material and Construction methods.	Cognitive	Understanding
CO2	Understand the fundamentals of architecture, construction management and environmental engineering	Cognitive	Understanding
CO3	Understand the advancement of water & waste water system, energy system	Cognitive	Understanding
CO4	Understand the use of Surveying equipment and advancement in Transportation system.	Cognitive	Understanding
CO5	Get a detailed study of computational methods in civil engineering	Cognitive	Understanding

COURSE CONTENT

UNIT I Importance of Civil Engineering and Materials 5

Basic Understanding: Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career, Professional ethics.

History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Industrial lectures and Case studies

Overview of National Planning for Construction and Infrastructure Development: Position of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for infrastructure works

Materials and methods of constructions: Stones, bricks, mortars, Plain, Reinforced &Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Composites; Plastics

UNIT II Introduction of Architecture, Environmental and Management Studies 4

Fundamentals of Architecture & Town Planning: Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Services; Green Buildings; Development of Smart cities

Basics of Construction Management: Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Advent of Lean Construction; Importance of Contracts Management

Environmental Engineering & Sustainability: Water treatment systems; Effluent treatment systems; Solid waste management; Recycling and Sustainability in Construction; Repairs and rehabilitation of structures

UNIT III	**Introduction of Geotechnical, Water resource and Ocean Engineering**	**5**

Geotechnical Engineering: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics &tunneling

Hydraulics, Hydrology &Water Resources Engineering: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Multipurpose reservoir projects

Ocean Engineering: Basics of Wave and Current Systems; Sediment transport systems; Ports &Harbors and other marine structures

UNIT IV	**Introduction of Structural Engineering, Transportation Engineering and Remote Sensing**	**8**

Structural Engineering: Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Power plant structures;

Traffic &Transportation Engineering: Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbor and airport sector; PPP in transport sector; Intelligent Transport Systems; Urban Public and Freight Transportation; Road Safety under heterogeneous traffic; Sustainable and resilient pavement materials, design, construction and management;

Surveying &Geomatics: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR

UNIT V	**Computational Methods in Civil Engineering**	**8**

Computational Methods, IT in Civil Engineering: Typical software used in Civil Engineering- Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; highway design (MX), Building Information Modeling; Highlighting typical available software systems (SAP, STAAD, ABAQUS, MATLAB, ETAB, NASTRAN, NISA, MIKE 21, MODFLOW, REVIT, TEKLA, AUTOCAD,…GEOSTUDIO, EDUSHAKE, MSP, PRIMAVERA, ArcGIS, VisSIM, …)

TUTORIALS	**15**

1. Develop a Strategic Plan for Civil Engineering works for next ten years based on past investments and identify one typical on-going mega project
2. Identify ten best civil engineering projects with high aesthetic appeal with one possible factor for

each; List down the possible systems required for a typical Smart City.

3. List top five tunnel projects in India and their features; collect and study geotechnical investigation report of any one Metro Rail (underground) project;
4. Visit a construction site and make a site visit report. Collect visual representations prepared by a Total Station and LIDAR and compare; Study typical Google street map and Google Earth Map and study how each can facilitate the other
5. Collect the history of a major rehabilitation project and list the interesting features

L	T	P	Total
30	15	0	45

TEXT BOOKS

1. L S Blake, (1989), Civil Engineer's Reference Book.
2. Patil, B.S.(1974), Legal Aspects of Building and Engineering Contract.
3. Archer Green. (2017) An Introduction to Civil Engineering.
4. MeenaRao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5. Chandiramani, Neelima (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai

REFERENCE BOOKS

1. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
2. P. S. Narayan (2000), Intellectual Property Rights, Gogia Law Agency
3. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
4. Bare text (2005), Right to Information Act
5. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
6. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	0	0	1	0	1	2	0	1	3	0	0	0	0	2
CO 2	0	3	0	0	2	0	0	0	1	1	0	0	1	1
CO 3	2	0	0	0	2	0	0	2	1	2	0	0	2	2
CO 4	0	0	1	0	3	0	2	1	1	1	0	0	2	0
CO 5	2	2	0	2	0	0	0	1	0	1	0	0	1	1
Total	4	5	2	2	8	2	2	5	6	5	0	0	6	6
Scaled Value	1	1	1	1	2	1	1	1	2	1	0	0	2	2

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**IV**
Subject Name	**MECHANICAL ENGINEERING**
Subject Code	**XCE401**

L –T –P –C	C:P:A	L –T –P –H
2- 2 – 0– 3	3.5:0.25:0.25	3- 1– 0 – 4

Course Outcome: After the completion of the course, students will be able to		***Domain C or P or A***	***Level***
CO1	After completing this course, the students will be able to ***apply*** energy balance to systems and control volumes, in situations involving heat and work interactions	Cognitive	Understanding
CO2	Students can ***Study*** the changes in thermodynamic properties of substances	Cognitive	Understanding
CO3	The students will be able to ***study*** the performance of energy conversion devices	Cognitive	Understanding
CO4	The students will be able to ***differentiate*** between high grade and low grade energies.	Cognitive	Understanding
CO5	Student can ***apply*** the energy balance to systems operating at different cycles.	Cognitive	Understanding

COURSE CONTENT

UNIT I	**BASIC CONCEPTS**	**9 hrs**

Fundamentals - System & Control volume; Property, State & Process; Exact & Inexact differentials; Work - Thermodynamic definition of work; examples; Displacement work; Path dependence of displacement work and illustrations for simple processes; electrical, magnetic, gravitational, spring and shaft work.

UNIT II	**LAWS OF THERMODYNAMICS**	**9 hrs**

Temperature, Definition of thermal equilibrium and Zeroth law; Temperature scales; Various Thermometers- Definition of heat; examples of heat/work interaction in systems- First Law for Cyclic & Non-cyclic processes; Concept of total energy E ; Demonstration that E is a property; Various modes of energy, Internal energy and Enthalpy

UNIT III	**PROPERTIES OF SUBSTANCES AND STEAM TABLES**	**9 hrs**

Definition of Pure substance, Ideal Gases and ideal gas mixtures, Real gases and real gas mixtures, Compressibility charts- Properties of two phase systems - Const. temperature and Const. pressure heating of water; Definitions of saturated states; P-v-T surface; Use of steam tables and R134a tables; Saturation tables; Superheated tables; Identification of states & determination of properties, Mollier's chart.

UNIT IV	**FLOW PROCESS AND THERMO DYNAMIC RELATIONS**	**9 hrs**

First Law for Flow Processes - Derivation of general energy equation for a control volume; Steady state steady flow processes including throttling; Examples of steady flow devices; Unsteady processes; examples of steady and unsteady I law applications for system and control volume

Second law - Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP; Kelvin-Planck and Clausius statements; Definition of reversible

process; Internal and external irreversibility; Carnot cycle; Absolute temperature scale.

UNIT V CYCLES AND PSYCHOMETRY 9 hrs

Thermodynamic cycles - Basic Rankine cycle; Basic Brayton cycle; Basic vapor compression cycle and comparison with Carnot cycle.

Psychrometry and Psychrometric charts, Psychrometric Processes and Refrigeration Cycles. Vapour compression and absorption Refrigeration systems

L = 30 hrs T = 15 hrs P=0 hrs Total = 45 hrs

TEXT BOOKS / REFERENCES

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, *Fundamentals of Thermodynamics*, John Wiley andSons.
2. Jones, J. B. and Duggan, R. E., 1996, *Engineering Thermodynamics*, Prentice-Hall of India
3. Moran, M. J. and Shapiro, H. N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons.
4. Nag, P.K, 1995, *Engineering Thermodynamics*, Tata McGraw-Hill Publishing Co.Ltd

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	-	1	-	3	-	2	2	2	-	-	2	0	2
CO 2	3	-	-	2	3	-	1	-	1	-	-	3	1	1
CO 3	1	-	1	3	1	-	1	2	-	2	-	1	2	2
CO 4	2	-	-	1	1	-	2	1	2	2	-	1	2	0
CO 5	-	-	-	1	1	-	-	-	1	1	-	2	1	1
Total	8	-	2	7	9	-	6	5	6	5	-	9	6	6
Scaled Value	2	0	1	2	2	1	2	1	2	1	0	2	2	2

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : IV
Course Code : XCE 403
Course Name : ENGINEERING GEOLOGY
Prerequisite :

L	T	P	C
1	0	2	2

C	P	A
2.5	0.5	0.5

L	T	P	H
1	0	2	3

Course Outcome: After the completion of the course, students will ***Domain*** ***Level***

be able to		***C or P or A***	
CO1	Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice	Cognitive Psychomotor	Applying Guided Response
CO2	The fundamentals of the engineering properties of Earth materials and fluids.	Cognitive Psychomotor Affective	Applying Guided Response Responding
CO3	Rock mass characterization and the mechanics of planar rock slides and topples.	Cognitive Affective	Understanding Responding
CO4	Soil characterization and the Unified Soil Classification System.	Cognitive Psychomotor Affective	Applying Guided Response Responding
CO5	The mechanics of soils and fluids and their influence on settlement, liquefaction, and soil slope stability.	Cognitive Affective	Understanding Responding

COURSE CONTENT

UNIT I	**GENERAL GEOLOGY**	**6**

Introduction-Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Department dealing with this subject in India and their scope of work- GSI, Granite Dimension Stone Cell, Petrology-Rock forming processes. Specific gravity of rocks. Ternary diagram. Igneous petrology- Volcanic Phenomenon and different materials ejected by volcanoes. Types of volcanic eruption. Mineralogical composition, structures & textures in rocks.

UNIT II	**PHYSICAL GEOLOGY**	**6**

Physical Geology- Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Residual deposits of Clay - with flints, Solifluction deposits, mudflows, Coastal deposits.

UNIT III	**GEOLOGICAL HAZARDS**	**6**

Geological Hazards- Rock Instability and Slope movement: Concept of sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. . Types of landslide. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment. Ground water: Factors controlling water bearing capacity of rock. Pervious & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves.Rock masses as construction material: Definition of Rock masses. Main features that affects the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas.

UNIT IV	**ENGINEERING GEOLOGY**	**6**

Geology of dam and reservoir site- Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favourable &unfavorable conditions in

different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures.

UNIT V ROCK MECHANICS

Rock Mechanics- Sub surface investigations in rocks and engineering characteristics or rocks masses; Structural geology of rocks. Classification of rocks, Field & laboratory tests on rocks, Stress deformation of rocks, Failure theories and sheer strength of rocks, Bearing capacity of rocks.

PRUCTICAL **30**

1. Study of physical properties of minerals.
2. Study of different group of minerals.
3. Study of Crystal and Crystal system.
4. Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase; Cryptocrystalline group: Jasper; Carbonate group: Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
5. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite, Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.
6. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties , Laterite, Limestone and its varieties, Shales and its varieties.
7. Identification of rocks (Metamorphic Petrology): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
8. Study of topographical features from Geological maps. Identification of symbols in maps.

L	T	P	Total
15	0	30	45

TEXT BOOKS

1. Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria& Sons.
2. Text Book of Engineering Geology, N. ChennaKesavulu, 2nd Edition (2009), Macmillan Publishers India.
3. Engineering Geology, N.ChennaKesavalu, JNTU College of Engineering, Hydrabad. (2014)
4. Engineering Geology**,** SubinoyGangopadhyay,(2016)

REFERENCE BOOKS

1. Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

E-Resources – MOOC's

NPTEL Video Lectures on Engineering Geology

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	0	3	1	0	0	0	1	1	2	0	3	2	0
CO 2	2	3	3	2	2	0	1	2	0	0	3	0	2	3
CO 3	2	3	3	3	2	2	1	2	0	0	0	2	2	3
CO 4	0	2	2	2	2	1	2	2	2	0	0	0	0	2
CO 5	3	0	2	3	2	0	2	3	2	2	1	2	3	0
Total	9	8	13	11	8	3	6	10	5	4	4	7	9	8
Scaled Value	2	2	3	3	2	1	2	2	1	1	1	2	2	2

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**V**
Subject Name	**PROFESSIONAL PRACTICE LAW& ETHICS**
Subject Code	**XMG508**
Prerequisite	**Nil**

L	**T**	**P**	**C**	**C**	**P**	**A**	**L**	**T**	**P**	**H**
3	**0**	**0**	**3**	**3**	**0**	**0**	**3**	**0**	**0**	**3**

Course Objectives

- To make the students understand the types of roles they are expected to play in thesociety as practitioners of the civil engineering profession
- To develop some ideas of the legal and practical aspects of their profession
- To familiarizes students with elementary knowledge of laws that would be of utility in their profession, including several new areas of law such as IPR, ADR.

Course Outcome: After the completion of the course, students will be able to		***Domain C or P or A***	***Level***
CO1	To Understand the various stakeholders roles and ethicsgoverning the profession	Cognitive	Understanding
CO2	To able to contracts management and dispute resolution mechanisms;	Cognitive	Understanding
CO3	To give an understanding of Intellectual Property Rights, Patents.	Cognitive	Understanding
CO4	Able to understand construction related laws	Cognitive	Understanding
CO5	To develop ideas of the legal and practical aspects of their profession	Cognitive	Understanding

COURSE CONTENT

UNIT I	**Professional Practice and Professional Ethics**	**9 Hrs**

Respective roles of various stakeholders: Government Agencies (constituting egulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens)-Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction); Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such asCEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Actsand Standards)

Definition of Ethics, Professional Ethics, Business Ethics,Corporate Ethics,Engineering Ethics, Personal Ethics; Code of Ethics as defined in thewebsite of Institution of Engineers (India); Profession, Professionalism, ProfessionalResponsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmentalbreaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing,protected disclosures.

UNIT II	**Contracts Management**	**9 Hrs.**

Indian Contract Act, 1972 and Amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidateddamages& Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public- Private Partnerships; International Commercial Terms;

UNIT III	**Arbitration, Conciliation and Alternative Dispute Resolution system**	**7 Hrs**

Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards;

Distinction between conciliation, negotiation, mediation and arbitration,confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; LokAdalats

UNIT IV **Labour and Labour& other construction-related Laws** **11 Hrs**

Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

UNIT V **Law relating to Intellectual property** **9 Hrs**

Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relatingto Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;

Lecture	Tutorial	Practical	Total
45	---	---	45

Text Books

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. ProfessionalOffset
3. NeelimaChandiramani (2000), The Law of Contract: An Outline, 2nd Edn. AvinashPublications Mumbai
4. Ethics in Engineering- M.W.Martin&R.Schinzinger, McGraw-Hill
5. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
6. Avtarsingh (2002), Law of Contract, Eastern Book Co.
7. Dutt (1994), Indian Contract Act, Eastern Law House
8. Anson W.R. (1979), Law of Contract, Oxford University Press

References

1. Engineering ethics: concepts and cases – C. E. Harris, M.S. Pritchard, M.J.Rabins
2. Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on
3. UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
4. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
5. The National Building Code, BIS, 2017
6. RERA Act, 2017

Web

1. Construction Contracts:http://www.jnormanstark.com/contract.html
2. Contracts Law : http://www.laderapress.com/laderapress/contractslaw1.html
3. Contract&Agreements : http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm
4. Contracts: http://206.127.69.152/jgretch/crj
5. Business & Personal Law: http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt
6. Types Of Contracts And Important Provisions: http://www.worldbank.org/ html/ opr/ consult/guidetxt/types.html
7. Contract Types/Pricing Arrangements: http://www.sandia.gov/policy

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1	1	1			1	1			1			1	1
CO 2	1	1	1			1	1			1			1	1
CO 3	2	1	1			1	1			1				
CO 4	2		2			3	1			1			3	2
CO 5	3		3			2	1			1			3	2
Total	**9**	**3**	**8**			**8**	**5**			**5**			**8**	**6**
Scaled Value	2	1	2	0	0	2	1	0	0	1	0	0	2	2

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

b. B.Tech - Part Time Bachelor of Technology in Civil Engineering (Part Time) – Before revision

SEMESTER I

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
PMA101	BSC	Mathematics (Transform & Computational Techniques)	**2**	**0**	**0**	**2**
PCE102	PCC	Disaster Preparedness & Planning	1	1	0	2
PCE103	ESC	Computer Aided Civil Engineering Drawing	1	0	2	2
PCE104	PCC	Mechanics of Fluids	2	0	2	3
PCE105	PCC	Mechanics of Solids	2	0	2	3
	TOTAL		**8**	**1**	**6**	**12**

SEMESTER II

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
PCE201	PCC	Instrumentation & Sensor Technologies for Civil Engineering Applications	2	0	2	3
PCE202	PCC	Materials Testing & Evaluation	2	0	2	3
PCE203	PCC	Mechanics of Materials	3	0	0	3
PMG204	**HSM**	**Professional Practice, Law & Ethics**	**2**	**0**	**0**	**2**
PES205	MAN	Environmental Studies	2	0	0	0
	TOTAL		**11**	**0**	**4**	**11**

SEMESTER III

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
PCE301	PCC	Geotechnical Engineering	2	0	2	3
PCE302	PCC	Hydraulic Engineering	2	0	2	3
PCE303	PCC	Structural Analysis	2	1	0	3

PCE304	PCC	Construction Engineering & Management	2	1	0	3
	TOTAL		**8**	**2**	**4**	**12**

SEMESTER IV

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
PCE401	PCC	Transportation Engineering	2	0	2	3
PCE402	PCC	Structural Engineering	2	1	0	3
PCE403	PCC	Hydrology & Water Resources Engineering	2	2	0	3
PCEE**	PEC	Elective-I	3	0	0	3
PCEE**	PEC	Elective-II	3	0	0	3
	TOTAL		**12**	**3**	**2**	**15**

SEMESTER V

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
PCE501	PCC	Environmental Engineering	2	0	2	3
PCE502	PEC	Elective-III	3	0	0	3
PCE503	PEC	Elective-IV	3	0	0	3
PCEE**	PEC	Elective V	3	0	0	3
PI505	HSM	Constitution of India	2	0	0	0
	TOTAL		**13**	**0**	**2**	**12**

SEMESTER VI

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
PCE601	PCC	Engineering Economics, Estimation & Costing	2	1	4	5
PCEE**	PEC	Elective-VI	3	0	0	3
PCEE**	PEC	Elective VII	3	0	0	3
	TOTAL		**8**	**1**	**4**	**11**

SEMESTER VII

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	

PCEE**	PEC	Elective VIII	2	0	0	2
PCE702	Project	Project	0	0	20	10
	TOTAL		**2**	**0**	**20**	**12**

Semester	**II**
Subject Name	**PROFESSIONAL PRACTICE LAW& ETHICS**
Subject Code	**PMG204**
Prerequisite	**Nil**

L	T	P	C	C	P	A	L	T	P	H
3	0	0	3	3	0	0	3	0	0	3

Course Objectives

- To make the students understand the types of roles they are expected to play in thesociety as practitioners of the civil engineering profession
- To develop some ideas of the legal and practical aspects of their profession
- To familiarizes students with elementary knowledge of laws that would be of utility in their profession, including several new areas of law such as IPR, ADR.

Course Outcome: After the completion of the course, students will be able to		***Domain C or P or A***	***Level***
CO1	To Understand the various stakeholders roles and ethicsgoverning the profession	Cognitive	Understanding
CO2	To able to contracts management and dispute resolution mechanisms;	Cognitive	Understanding
CO3	To give an understanding of Intellectual Property Rights, Patents.	Cognitive	Understanding
CO4	Able to understand construction related laws	Cognitive	Understanding
CO5	To develop ideas of the legal and practical aspects of their profession	Cognitive	Understanding

COURSE CONTENT

UNIT I **Professional Practice and Professional Ethics** **9 Hrs**

Respective roles of various stakeholders: Government Agencies (constituting egulatory bodies and standardization organizations, prescribing norms to ensure
safety of the citizens)-Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction); Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such asCEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Actsand Standards)
Definition of Ethics, Professional Ethics, Business Ethics,Corporate Ethics,Engineering Ethics, Personal Ethics; Code of Ethics as defined in thewebsite of Institution of Engineers (India); Profession, Professionalism, ProfessionalResponsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmentalbreaches, Negligence, Deficiencies in

state-of-the-art; Vigil Mechanism, Whistleblowing,protected disclosures.

UNIT II	**Contracts Management**	**9 Hrs.**

Indian Contract Act, 1972 and Amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidateddamages& Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public- Private Partnerships; International Commercial Terms;

UNIT III	**Arbitration, Conciliation and Alternative Dispute Resolution system**	**7 Hrs**

Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration,confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; LokAdalats

UNIT IV	**Labour and Labour& other construction-related Laws**	**11 Hrs**

Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

UNIT V	**Law relating to Intellectual property**	**9 Hrs**

Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relatingto Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;

Lecture	**Tutorial**	**Practical**	**Total**
45	**---**	**---**	**45**

Text Books

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. ProfessionalOffset
3. NeelimaChandiramani (2000), The Law of Contract: An Outline, 2nd Edn. AvinashPublications Mumbai
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3. Contract&Agreements : http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm
4. Contracts: http://206.127.69.152/jgretch/crj
5. Business & Personal Law: http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt
6. Types of Contracts And Important Provisions: http://www.worldbank.org/ html/ opr/consult/guidetxt/types.html
7. Contract Types/Pricing Arrangements: http://www.sandia.gov/policy

Mapping of CO with PO's

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CO 1	1	1	1			1	1			1			1	1
CO 2	1	1	1			1	1			1			1	1
CO 3	2	1	1			1	1			1				
CO 4	2		2			3	1			1			3	2
CO 5	3		3			2	1			1			3	2
Total	**9**	**3**	**8**			**8**	**5**			**5**			**8**	**6**
Scaled Value	2	1	2	0	0	2	1	0	0	1	0	0	2	2

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

4.a. Curicullum and Syllabus of the programme – After Revision

a. Bachelor of Technology in Civil Engineering (Full Time)

S.No	Description		Courses	Credits				Hours			
				L	T	P	TO	L	T	P	TO
Semester I											
1.	MA-I	XMA101	Calculus and Linear Algebra	3	1	0	4	3	1	0	4
2.	BE	XBE102	Electrical and Electronic Engineering Systems	3	1	0	4	3	1	0	4
3.	P	XAP103	Physics	3	1	0	4	3	1	0	4
4.	EG	XEG104	Engineering Graphics and Design	1	0	2	3	1	0	4	5
5.	SC	XGS105	Speech Communication	0	0	3	3	3	0	0	3
6.	UMAN-I	XUM106	Constitution of India	0	0	0	0	3	0	0	3
7.	BE-L	XBE107	Electrical and Electronic Engineering Systems Lab	0	0	1	1	0	0	2	2
8.	PL	XAP108	Physics Lab	0	0	1	1	0	0	2	2
			Total				**20**				**27**
Semester II											
1.	MA-II	XMA201	Calculus, Ordinary Differential Equations and ComplexVariable	3	1	0	4	3	1	0	4
2.	PPS-T	XCP202	Programming for ProblemSolving	3	0	0	3	3	0	0	3
3.	C	XAC203	Chemistry	3	1	0	4	3	1	0	4
4.	TC	XGS204	Technical Communication	2	0	0	2	2	0	0	2
5.	Works	XWP205	Workshop Practices	1	0	2	3	1	0	4	5
6.	EM	XEM206	Engineering Mechanics	3	0	0	3	3	0	0	3
7.	PPS-L	XCP207	Programming for Problem Solving Lab	0	0	1	1	0	0	2	2
8.	CL	XAC208	Chemistry Lab	0	0	1	1	0	0	2	2
			Total				**21**				**25**

S.No	Description		Courses	Credits				Hours			
				L	T	P	TO	L	T	P	TO
Semester III											
1.	MA-III	XCE301	Transforms and Partial Differential Equations	3	0	0	3	3	0	0	3
2.	PCC T	XCE302	Mechanics of Solids-I	2	1	0	3	2	2	0	4
3.	PCC-T	XCE303	Fluid Mechanics and Machinery	2	1	0	3	2	2	0	4
4.	PCC-T	XCE304	Building Materials and Construction	3	0	0	3	3	0	0	3
5.	PCC-T	XCE305	Surveying – I	2	1	0	3	2	2	0	4
6.	MNGT-I	XUM306	Entrepreneurship Development	2	0	0	2	2	0	0	2

7.	UMAN-II	MC	Universal Human Values 2: Understanding Harmony and gender	2	1	0	3	2	1	0	3
8.	PCC-L	XCE308	Strength of Materials Lab	0	0	1	1	0	0	2	2
9.	PCC-L	XCE309	Fluid Mechanics and Machinery Lab	0	0	1	1	0	0	2	2
10.	IPT-I	XCE310	In-plant Training-I	-	-	-	1	-	-	-	-
			Total				**23**				**27**
Semester IV											
1.	MA-IV	XCE401	Probability and statistics	3	0	0	3	3	0	0	3
2.	PCC T	XCE402	Mechanics of Solids-II	2	1	0	3	2	2	0	4
3.	PCC-T	XCE403	Surveying – II	2	1	0	3	2	2	0	4
4.	PCC-T	XCE404	Geotechnical Engineering - I	2	1	0	3	2	2	0	4
5.	PCC-T	XCE405	Concrete Technology	3	0	0	3	3	0	0	3
6.	MNGT-II	X**406	Economics for Engineers	3	0	0	3	3	0	0	3
7.	UMAN-III	X**407	Disaster Management	0	0	0	0	3	0	0	3
8.	PCC-L	XCE408	Computer Aided Civil Engineering Drawing	0	0	1	1	0	0	2	2
9.	PCC-L	XCE409	Surveying Lab	0	0	1	1	0	0	2	2
10.	PCC-L	XCE410	Geotechnical Engineering Lab	0	0	1	1	0	0	2	2
			Total				**21**				**30**

S.No	**Description**		**Courses**	**Credits**				**Hours**			
				L	**T**	**P**	**TO**	**L**	**T**	**P**	**TO**
Semester V											
1.	PCC T	XCE501	Structural Analysis	2	1	0	3	2	2	0	4
2.	PCC-T	XCE502	Transportation Engineering	3	0	0	3	3	0	0	3
3.	PCC-T	XCE503	Environmental Engineering	3	0	0	3	3	0	0	3
4.	PCC-T	XCE504	Geotechnical Engineering - II	2	1	0	3	2	2	0	4
5.	PEC-I	XCEE**	Professional Elective -I	3	0	0	3	3	0	0	3
6.	OE I	XOE**	Open Elective Courses-I	3	0	0	3	3	0	0	3
7.	PCC-L	XCE505	Environmental Engineering Lab	0	0	1	1	0	0	2	2
8.	PCC-L	XCE506	Concrete & Highway Lab	0	0	1	1	0	0	2	2
9.	IPT-II	PROJ	In-plant Training – II	-	-	-	1	-	-	-	-
			Total				**21**				**24**
Semester VI											
1.	PCC -T	XCE601	Design of RCC Structures	3	1	0	4	3	2	0	5
2.	PCC- T	XCE602	Design of Steel Structures	2	1	0	3	2	2	0	4
3.	PCC-T	XCE603	Construction Engineering and Management	3	0	0	3	3	0	0	3

4.	PEC-II	XCEE**	Professional Elective -II	3	0	0	3	3	0	0	3
5.	OE II	XOE**	Open Elective Courses-II	3	0	0	3	3	0	0	3
6.	ELS	X**604	English Language Skills	1	0	2	3	1	0	4	5
7.	UMAN-IV	X**605	Cyber Security	0	0	0	0	3	0	0	3
8.	PCC-L	XCE606	Construction Management Lab	0	0	1	1	0	0	2	2
9.	PCC-L	XCE607	Survey Camp	0	0	1	1	0	0	2	2
			Total				**21**				**26**

S.No	**Description**		**Courses**	**Credits**				**Hours**			
				L	**T**	**P**	**TO**	**L**	**T**	**P**	**TO**
Semester VII											
1.	PCC-T	XCE701	Finite Element Method	3	0	0	3	3	0	0	3
2.	PEC-III	PEC	Professional Elective III	3	0	0	3	3	0	0	3
3.	OE III	OE	Open Elective Courses-III	3	0	0	3	3	0	0	3
4.	UMAN-V	MC	Environmental studies	0	0	0	0	3	0	0	3
5.	PCC-L	XCE703	Computer Aided Design & Drafting	0	0	1	1	0	0	2	2
6.	PCC-L	XCE704	Estimation, Costing and valuation	0	0	2	2	0	0	4	4
7.	Proj I	PROJ	Project Work (Phase-I)	0	0	3	3	0	0	6	6
8.	IPT III	PROJ	In-plant Training – III	-	-	-	3	-	-	-	-
			Total				**18**				**24**
Semester VIII											
1.	PEC-IV	PEC	Professional Elective -IV	3	0	0	3	3	0	0	3
2.	OE IV	OE	Open Elective Courses-IV	3	0	0	3	3	0	0	3
3.	OE V	OE	Open Elective Courses-V	3	0	0	3	3	0	0	3
4.	PROJ II	PROJ	Project Work (Phase-II)	0	0	9	9	0	0	18	18
			Total				**18**				**27**
Total Credit - 159											
Honor's Degree (CGPA> 9.0 with first attempt)											
1.	PEC-H	PEC	Honor's Elective -I	3	0	0	3	3	0	0	3
2.	PEC-H	PEC	Honor's Elective -II	3	0	0	3	3	0	0	3
3.	PEC-H	PEC	Honor's Elective -III	3	0	0	3	3	0	0	3
4.			Journal Publication	1	0	0	1	0	0	0	0

PROFESSIONAL ELECTIVE COURSE - CIVIL ENGINEERING

[PEC-CE]

Professional Elective Course I

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
XCEE01	PEC	Smart Structures and Materials	3	0	0	3
XCEE02	PEC	GIS for Civil Engineering	3	0	0	3
XCEE03	PEC	Water Quality Engineering	3	0	0	3
XCEE04	PEC	Pavement Design	3	0	0	3
XCEE05	PEC	Construction Equipment and Automation	3	0	0	3
XCEE06	PEC	Airport Planning and Design	3	0	0	3
XCEE07	PEC	Port and Harbour Engineering	3	0	0	3

Professional Elective Course II

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
XCEE08	PEC	Earthquake Engineering	3	0	0	3
XCEE09	PEC	Bridge Engineering	3	0	0	3
XCEE10	PEC	Advanced Structural Analysis	3	0	0	3
XCEE11	PEC	Basics of Computational Hydraulics	3	0	0	3
XCEE12	PEC	Water Resources Engineering	3	0	0	3
XCEE13	PEC	Environmental Geotechnology	3	0	0	3
XCEE14	PEC	Geotechnical Design	3	0	0	3

Professional Elective Course III

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	

XCEE15	PEC	Environmental Fluid Mechanics	3	0	0	3
XCEE16	PEC	Environmental Impact Assessment	3	0	0	3
XCEE17	PEC	Design of Hydraulic Structures	3	0	0	3
XCEE18	PEC	Surface Hydrology	3	0	0	3
XCEE19	PEC	Repairs and Rehabilitation of Structures	3	0	0	3
XCEE20	PEC	Urban Hydrology and Hydraulics	3	0	0	3
XCEE21	PEC	Building Construction Practice	3	0	0	3

Professional Elective Course IV

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
XCEE22	PEC	Tall Structures				
XCEE23	PEC	Environmental Law and Policy	3	0	0	3
XCEE24	PEC	Groundwater Engineering	3	0	0	3
XCEE25	PEC	Solid and Hazardous Waste Management	3	0	0	3
XCEE26	PEC	Pre-stressed and Prefabricated Structures	3	0	0	3
XCEE27	PEC	Contracts Management	3	0	0	3
XCEE28	PEC	Air and Noise Pollution and Control	3	0	0	3

OPEN ELECTIVE COURSES

Sub. Code	Name of the Course	Hours per week			C
		L	T	P	
XCEOE1	Remote Sensing & GIS	3	0	0	3
XCEOE2	Building Services	3	0	0	3
XCEOE3	Non Destructive Testing	3	0	0	3
XCEOE4	Metro Systems and Engineering	3	0	0	3

Note

L – Lecture, T – Tutorial, P – Practical, C – Credit

Semester	**II**
Subject Name	**SPEECH COMMUNICATION**
Subject Code	**XGS105**
Prerequisite	**Nil**

L	T	P	C	C	P	A	L	T	P	H
0	1	2	3	2.6	0.4	0	0	1	4	5

Course Outcome: After the completion of the course, students will be able to		***Domain C or P or A***	***Level***
CO1	***Ability*** to recall the types of speeches	Cognitive	Remember
CO2	***Apply*** the techniques in public speaking	Cognitive	Apply
CO3	***Identify*** the common patterns in organizing a speech	Cognitive	Remember
CO4	***Construct*** the nature and style of speaking	Cognitive	Create
CO5	***Practicing*** the speaking skills	Psychomotor	Guided Response

COURSE CONTENT

UNIT I TYPES OF SPEECHES **9**

1.1 – Four types of speeches

1.2 – Analyzing the audience

1.3 - Developing ideas and supporting materials

UNIT II PUBLIC SPEAKING **9**

2.1 - Introduction to Public Speaking

2.2 - Competencies Needed for successful speech making

2.3 – Speaking about everyday life situations

UNIT III ORGANIZATION OF SPEECH **9**

3.1 – Developing a speech out line

3.2 - Organizing the speech

3.3 – Introduction - development – conclusion

UNIT IV PRESENTATION **9**

4.1 - Tips for preparing the draft speech

4.2 – Presentation techniques using ICT tools

4.3 – Using examples from different sources

UNIT V ACTIVITIES **9**

5.1 – Reading activities

5.2 – Creative presentations

5.3 – Media presentation techniques

L	T	P	Total
0	15	30	45

SUGGESTED READINGS

1. Sanjay Kumar and Pushp Lata. *Communication Skills*. Oxford University Press. 2011
2. Michael Swan. *Practical English Usage*. OUP. 1995

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	0	0	0	0	0	0	0	1	3	3	0	2	0	0
CO 2	0	0	0	0	0	0	0	1	3	3	0	2	0	0
CO 3	0	0	0	0	0	0	0	1	2	3	0	2	0	0
CO 4	0	0	0	0	0	0	0	1	2	3	0	2	0	0
CO 5	0	0	0	0	0	0	0	1	2	3	0	2	0	0
Total	0	0	0	0	0	0	0	5	12	15	0	10	0	0
Scaled Value	0	0	0	0	0	0	0	1	3	3	0	2	0	0

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**I**
Subject Name	**XBE107**
Subject Code	**ELECTRICAL AND ELECTRONIC ENGINEERING SYSTEMS LAB**
Prerequisite	**BASIC PHYSICS IN HSC LEVEL**

L	T	P	C	C	P	A	L	T	P	H
0	0	1	1	1.5	1	0.5	0	0	2	2

Course Objectives : The course helps to

- Learn the basic concepts of electrical and electronics components.
- Understand the basic wiring methods and connection.
- Study the characteristics of diodes, Zener diodes, NPN transistors.
- Verify the working of simple logic gates, adders and subtractors.

Course Outcome: After the completion of the course, students will be ***Domain*** ***Level***

able to		***C or P or A***	
CO1	***Apply***the fundamental electrical concepts and ***differentiate*** the various electronic components.	Cognitive	Understand
		Psychomotor	Set
		Affective	Valuing
CO2	***Implement*** and ***execute*** the different types of wiring connections.	Cognitive	Understand
		Psychomotor	Set
		Affective	Valuing
CO3	***Demonstrate*** the Fluorescent lamp connection with choke.	Cognitive	Understand
		Psychomotor	Set
		Affective	Valuing
CO4	***Characterize*** and ***display*** the basic knowledge on the working of PN junction and Zener diode.	Cognitive	Understand
		Psychomotor	Set
		Affective	Valuing
CO5	***Implement*** and ***execute***the various digital electronic circuits such as Adders and Subtractors.	Cognitive	Understand
		Psychomotor	Set
		Affective	Valuing

COURSE CONTENT

LIST OF EXPERIMENTS

Ex. No	Experiments
1.	Study of Electrical Symbols, Tools and Safety Precautions, Power Supplies.
2.	Study of Active and Passive elements – Resistors, Inductors and Capacitors, Bread Board.
3.	Testing of DC Voltage and Current in series and parallel resistors which are connected in breadboard by using Voltmeter, Ammeter and Multimeter.
4.	Fluorescent lamp connection with choke.
5.	Staircase Wiring
6.	Forward and Reverse bias characteristics of PN junction diode.
7.	Forward and Reverse bias characteristics of zener diode.
8.	Input and Output Characteristics of NPN transistor.
9.	Construction and verification of simple logic gates.
10.	Construction and verification of adders and subtractors.

L	T	P	Total
0	0	30	30

Text Books

9. Laboratory Manual "Electrical and Electronic Engineering Systems Lab", Department of Electrical and Electronics Engineering, PMIST, Thanjavur.

Mapping of CO with PO's

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3	3	1	1	1	1	0	0	1	1	1	0
CO 2	3	3	1	1	1	1	0	0	1	1	1	0
CO 3	2	2	2	1	2	2	1	1	1	1	1	0
CO 4	2	2	1	1	1	1	1	1	1	1	1	0
CO 5	2	2	1	1	1	1	1	1	1	1	1	0
Total	12	12	6	5	6	6	3	3	5	5	5	0
Scaled Value	3	3	2	1	2	2	1	1	1	1	1	0

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**II**
Subject Name	**TECHNICAL COMMUNICATION**
Subject Code	**XGS204**
Prerequisite	**Nil**

L	**T**	**P**	**C**	**C**	**P**	**A**	**L**	**T**	**P**	**H**
2	**0**	**0**	**2**	**3**	**0**	**0**	**2**	**0**	**0**	**2**

Course Outcome: After the completion of the course, students will be able to		***Domain C or P or A***	***Level***
CO1	***Ability*** to understand the basic principles	Cognitive	Remember
CO2	***Apply*** the techniques in writing	Cognitive	Apply
CO3	***Identify***communicative styles	Cognitive	Remember
CO4	***Construct*** the nature of writing	Cognitive	Create

COURSE CONTENT

UNIT I – Basic Principles **9**

1.1 – Basic Principles of Technical Writing

1.2 – Styles used in Technical Writing

1.3 – Language and Tone

UNIT II – Techniques **9**

2.1 – Special Techniques used in writing

2.2 – Definition & Description of mechanism

2.3 – Description- Classification-Interpretation

UNIT III – Communication **9**

3.1 – Modern development in style of writing

3.2 - New letter writing formats

UNIT IV – Report Writing **9**

4.1 – Types of Report writing

4.2 – Project writing formats

L	T	P	Total
30	0	0	30

SUGGESTED READINGS

1. John Sealy, Writing and Speaking Author; Oxford University Press, New Delhi, 2009
2. Williams K.S, Communicating Business. Engage Learning India Pvt Ltd, 2012

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	0	0	0	0	0	0	0	1	3	3	0	2	0	0
CO 2	0	0	0	0	0	0	0	1	3	3	0	2	0	0
CO 3	0	0	0	0	0	0	0	1	2	3	0	2	0	0
CO 4	0	0	0	0	0	0	0	1	2	3	0	2	0	0
CO 5	0	0	0	0	0	0	0	1	2	3	0	2	0	0
Total	0	0	0	0	0	0	0	5	12	15	0	10	0	0
Scaled Value	0	0	0	0	0	0	0	1	3	3	0	2	0	0

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**III**
Subject Name	**Transforms and Partial Differential Equations**
Subject Code	**XMA 301**
Prerequisite	Algebra , Calculus and Laplace Transforms

L	T	P	C	C	P	A	L	T	P	H
3	0	0	3	2.50	0.25	0.25	3	0	0	3

Course Objectives

1. Introduction of methods to solve linear partial differential equations of second order and higher order.
2. Find the solutions of pde's are determined by conditions at the boundaries of the spatial domain and initial conditions at time zero.
3. Provide sufficient knowledge to engineering students in the specific mathematical tools and techniques such as Fourier series, Fourier transform and Z transform.
4. To enable students to use Fourier series method both in the solution of pde and other wider context

Course Outcome: After the completion of the course, students will be able to		***Domain C or P or A***	***Level***
CO1	**Solve** standard types of first order and second order partial differential equations with constant coefficients. Elimination of arbitrary constants and functions.	Cognitive	Applying
CO2	**State** Dirichlet's condition. **Explain** general Fourier series of the curve y = f(x) in the interval (0,2π) (-π, π), (0, 2 ℓ), (-ℓ,ℓ) , (0, π) and (0,ℓ). Perform harmonic analysis.	Cognitive	Understanding Guided Response
CO3	**Solve** one dimensional Wave equation and Heat flow equation by Fourier series method in Cartesian coordinates. Classify second order quasi pde.	Psychomotor Cognitive	Applying Receiving
CO4	**Find** the Fourier transform and Fourier sine and cosine transforms of simple functions **using** definition and its properties.	Affective Cognitive	Applying
CO5	**Apply** the properties of Z transform to **find** the Z transform and inverse Z transform of sequence and functions, and to solve the difference equation using them.	Cognitive	Applying

COURSE CONTENT

UNIT I PARTIAL DIFFERENTIAL EQUATIONS	9
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second order with constant coefficients.	
UNIT II FOURIER SERIES	**9**
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Harmonic Analysis.	
UNIT III APPLICATIONS TO BOUNDARY VALUE PROBLEMS	**9**
Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state conditions (zero Boundary conditions only).	
UNIT IV FOURIER TRANSFORM	**9**
Fourier transform pairs – Fourier Sine and Cosine transforms – properties – Transforms of simple functions – Parseval's identity.	
UNIT V Z TRANSFORM AND DIFFERENCE EQUATIONS	**9**
Z-transform – Elementary properties – Inverse Z – transform – Convolution theorem - Solution of difference equations using Z-transform.	

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi (2012).
2. Veerarajan. T., "Engineering Mathematics Volume III", Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012.

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1. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw Hill Book Co., Singapore (1987).
2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company Ltd., New Delhi (1996).
3. Bali N.P. and Manish Goyal, "A Text Book of Engineering Mathematics" 7th Edition Lakshmi Publications (P) Limited, New Delhi (2007).
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.
5. Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.
6. Narayanan, S., ManicavachagomPillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volume: II and III, S.Viswanathan (Printers

and Publishers) Pvt. Ltd., Chennai (2002).
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nptel:Advanced Engineering Mathematics, Prof. Jitendra Kumar, Department of Mathematics, Indian Institute of Technology, Kharagpur, India.

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3	2	0	0	2	0	0	0	0	1	0	2
CO 2	3	1	0	0	0	0	0	0	0	1	0	1
CO 3	3	1	0	0	0	0	0	0	0	1	0	1
CO 4	3	2	0	0	0	0	0	0	0	1	0	1
CO 5	3	2	0	0	1	0	0	0	0	1	0	2
Total	15	8	0	0	3	0	0	0	0	5	0	7
Scaled Value	3	2	0	0	1	0	0	0	0	1	0	2

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : III

Course Code : XCE 304

Course Name : BUILDING MATERIALS AND CONSTRUCTION

Prerequisite : NIL

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

Course Objectives

- Acquire knowledge on building materials
- Study various aspects of paints, varnishes and timber.
- Learn the construction principles of floors and finishing.

Course Outcome: After the completion of the course, students will be able to	**Domain C or P or A**	**Level**

CO1	Explain the characteristics of stones and bricks.	Cognitive	Understand
CO2	Describe the properties and tests on cement, aggregate, concrete, mortar.	Cognitive	Remember
CO3	Understand the significance of emerging building materials.	Cognitive	Understand
CO4	Identify the suitability of timber, paints and varnishes for building works.	Cognitive	Understand
CO5	Review the construction principles of floors.	Cognitive	Remember

COURSE CONTENT

UNIT I STONES, BRICKS AND TILES 9

Stones: Properties of building stones-- relation to their structural requirements, classification of stones - stone quarrying - precautions in blasting, dressing of stone.

Bricks: Composition of good brick earth, various methods of manufacturing of bricks, Characteristics of good building bricks, classification of bricks. Introduction to light weight bricks.

Tiles: Characteristics of good tile – manufacturing methods, types of tiles,Economics and availability of materials. Uses of materials like Aluminum, Gypsum, Glass and Bituminous materials-- their quality.

UNIT II LIME , CEMENT AND AGGREGATES 9

Lime: Various, ingredients of lime - Constituents of lime stone classification of lime - various methods ofManufacture of lime and Fly ash applications.

Cement: Portland cement- Chemical Composition - Hydration, setting and fineness of cement. Various Types of cement and their properties. A Various field and laboratory tests for Cement.

Fine Aggregate: Characteristics of good sand and its classifications, bulking of sand. Alternatives to natural sand. Coarse Aggregate: Characteristics of good coarse aggregates for manufacture of concrete. Tests on aggregates.

UNIT III MORTAR, MASONRY AND TIMBER 9

Mortar: Different types of mortars, preparation, setting and curing. Manufacturing methods of mortar. Concrete: Designation, workability of concrete in fresh state. Reinforcing steel: Types of reinforcement, specifications

Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls.

Timber: Timber as a building material and its uses. Various types of timber. Seasoning and its importance. Preservation of wood. Plywood & Laminates and their uses.

UNIT IV	BUILDING COMPONENTS	9

Lintels, arches, vaults, stair cases - types. Different types of floors Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs - King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre fabricated roofs.

UNIT V	FLOORING AND FINISHING	9

Floors: Characteristics of good floors. Common types of floors. Stone flooring, concrete flooring, Terrazo flooring. Ceramic and mosaic tiles. Industrial floors. Methods of construction, and maintenance.

Finishing: Damp Proofing and water proofing materials_ and uses- Plastering Pointing, white washing and Distempering –Paints: Constituents of paint - Types of paints - Painting of new old wood- Varnish. -Form Works and Scaffoldings.

L	T	P	Total
3	0	0	3

TEXT BOOKS

1. Engineering Materials, Rangwala, S.C, (36th edition), Anand Charotar Publishing House, 2009.
2. Building Construction, S.S. Bhavikatti, Vikas publications House Pvt. ltd.
3. Building Materia1s, B.C. Punmia, Laxmi Publications Pvt. Ltd.
4. Building construction, (10^{th} edition), Punmia, B. C. Laxmi Publications, Bangalore, 2009.
5. A Text Book of Building Construction, Arora S.P. and Bindra S.P., Dhanpat Rai & Sons Publications, 2013.
6. Gambhir M.L., Neha Jamwal, Building Materials: Products, Properties and Systems, McGraw Hill Education (India) Private Limited, 2011.
7. Sushil Kumar, Building Construction, Standard Publishers, 2006.

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1. Building Materials, M.L.Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Building construction, P.C.Verghese, PHI Learning (P) Ltd.
3. Building construction and construction materials, Birdie, G.S. and Ahuja, T.D., Dhanpath Rai Publishing company, “New Delhi, 1986.
4. Advances in Building Materials and Construction, Central Building Research Institute, Roorkee, 2004

E-REFERENCES

http://nptel.iitm.ac.in

IS Codes

National Building Code of India, 2005.

Mapping of CO with PO’s

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	1	0	0	0	1	0	1	1	1	0	0	0	1
CO 2	3	2	2	1	1	2	0	1	1	1	0	0	2	1
CO 3	3	2	2	1	1	2	1	1	2	2	0	1	2	1
CO 4	3	3	3	2	1	2	1	1	2	2	0	1	2	1
CO 5	2	1	0	0	1	0	1	2	2	1	0	1	0	1
Total	13	9	7	4	4	7	3	6	6	7	0	3	6	5
Scaled Value	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : III

Course Code : XUM 007

Course Name : Universal Human Values 2: Understanding Harmony

Prerequisite : None. Universal Human Values-I (Desirable)

L	T	P	C
2	1	0	3

C	P	A
3	0	0

L	T	P	H
2	1	0	3

COURSES ON HUMAN VALUES

During the Induction Program, students would get an initial exposure to human values through Universal Human Values-I. This exposure is to be augmented by this compulsory full semester foundation course.

Objective

This introductory course input is intended:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspiration so fall human beings.

2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.

3. To highlight plausible implications of such a Holistic understanding in terms of ethical human

conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Thus, this course is intended to provide a much needed orientation input in value education to the young enquiring minds.

Salient Features of the Course

The salient features of this course are:

1. It presents a universal approach to value education by developing the right understanding of reality (i.e. a worldview of the reality "as it is") through the process of self-exploration.
2. The whole course is presented in the form of a dialogue whereby a set of proposals about various aspects of the reality are presented and the students are encouraged to self-explore the proposals by verifying them on the basis of their natural acceptance within oneself and validate experientially in living.
3. The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information.
4. While introducing the holistic world view and it simplications, a critical appraisal of the prevailing notions is also made to enable the students discern the difference on their own right.

Course Methodology

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. The course is in the form of 28lectures (discussions) and14 practice sessions.
3. It is free from any dogma or value prescriptions.
4. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation – the whole existence is the lab and every activity is a source of reflection.
5. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	*Explore* about the need of value education.	Cognitive	Understand
CO2	*Interpret* self and body needs and responses to ensure harmony within self.	Cognitive	Understand
CO3	*Explore* the harmony in the family and society	Cognitive	Understand
CO4	*Explore* about the harmony in the nature / existence	Cognitive	Understand

CO5 *Discuss* about the holistic understanding. Cognitive Understand

. COURSE TOPICS

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

The syllabus for the lectures and practice sessions is given below:

Module 1	**Introduction to Value Education**	**6**	**3**

Lecture 1	:	Understanding Value Education
Lecture **2**	:	Self-exploration as the Process for Value Education
Tutorial 1	:	Practice Session *PS1:* *Sharing about Oneself*
Lecture **3**	:	Continuous Happiness and Prosperity– the Basic Human Aspirations
Lecture **4**	:	Right Understanding, Relationship and Physical Facility
Tutorial 2	:	PracticeSessionPS*2 :Exploring Human Consciousness*
Lecture **5**	:	Happiness and Prosperity– Current Scenario
Lecture **6**	:	Method to Fulfill the Basic Human Aspirations
Tutorial 3	:	Practice Session PS*3 :* *Exploring Natural Acceptance*

Expected outcome:

The students start exploring themselves: get comfortable with each other and with the teacher; they start appreciating the need and relevance for the course.

The students start finding that technical education without study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of most of the present-day problems; and a sustained solution could emerge only through understanding of value-based living. Any solution brought out through fear, temptation of dogma will not be sustainable.

The students are able to see that verification on the basic of natural acceptance and experiential validation through living is the only way to verify right or wrong, and referring to any external source like text or instrument or any other person cannot

enable them to verify with authenticity; it will only develop assumptions.

The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to overcome this disharmony.

The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facility in most of the cases, while they have given higher priority to earning of physical facility in their life giving less value to or even ignoring relationships and not being aware that right understanding is the most important requirement for any human being.

Module 2	**Harmony in the Human Being**	**6**	**3**

Lecture **7**	:	Understanding Human being as the Co-existence of the Self and the Body
Lecture **8**	:	Distinguishing between the Needs of the Self and the Body
Tutorial 4	:	Practice Session PS*4 : Exploring the difference of Needs of Self and Body*
Lecture **9**	:	The Body as an Instrument of the Self
Lecture **10**	:	Understanding Harmony in the Self
Tutorial 5	:	Practice Session PS*5 : Exploring Sources of Imagination in the Self*
Lecture **11**	:	Harmony of the Self with the Body
Lecture **12**	:	Programme to ensure self-regulation and Health
Tutorial 6	:	Practice Session PS*6* ***:*** *Exploring Harmony of Self with the Body*

Expected outcome:

The students are able to see that they can enlist their desires and the desires are not vague. Also they are able to relate their desires to 'I' and 'Body' distinctly. If any desire appears related to both, they are able to see that the feeling is related to I while the physical facility is related to the body. They are also able to see that 'I' and Body are two realities, and most of their desires are related to 'I' and not body, while their efforts are mostly centered on the fulfillment of the needs of the body

assuming that it will meet the needs of 'I' too.

The students are able to see that all physical facility they are required for a limited time in a limited quantity. Also they are able to see that in case of feelings, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable even for a single moment.

The students are able to see that activities like understanding, desire, though and selection are the activities of 'I' only the activities like breathing, palpitation of different parts of the body are fully the activities of the body with the acceptance of 'I' while the activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs etc. are such activities that require the participation of both 'I' and body.

The students become aware of their activities of 'I' and start finding their focus of attention at different moments. Also they are able to see that most of their desires are coming from outside (through preconditioning or sensation) and are not based on their natural acceptance

The students are able to list down activities related to proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing different diseases.

Module 3	Harmony in the Family and Society	**6**	**3**

Lecture 1**3** : Harmony in the Family –the Basic Unit of Human Interaction

Lecture **14** : Values in Human-to-Human Relationship

Lecture **15** : 'Trust' – the Foundational Value in Relationship

Tutorial 7 : Practice Session PS *7* *Exploring the Feeling of Trust*

Lecture **16** : 'Respect'–as the Right Evaluation

Tutorial 8 : Practice Session PS *8* *Exploring the Feeling of Respect*

Lecture **17** : Understanding Harmony in the Society

Lecture **18** : Vision for the Universal Human Order

Tutorial 9 : Practice Session PS *9* *Exploring Systems to fulfill Human Goal*

Expected outcome:

The students are able to note that the natural acceptance (intention) is always for

living in harmony, only competence is lacking! We generally evaluate ourselves on the basis of our intention and others on the basis of their competence! We seldom look at our competence and others' intention as a result we conclude that I am a good person and other is a badperson.

The students are able to see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship. Many present problems in the society are an outcome of differentiation (lack of understanding of respect), like gender biasness, generation gap, caste conflicts, class struggle, dominations through power play, communal violence, clash of isms and so on so forth.

All these problems can be solved by realizing that the other is like me a she has the same natural acceptance, potential and program to ensure a happy and prosperous life for them and for others through he may have different body, physical facility or beliefs.

The students are able to use their creativity for education children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

Module 4	Harmony in the Nature/Existence	**4**	**2**

Lecture **19** : Understanding Harmony in the Nature

Lecture **20** : Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature

Tutorial 10 : Practice Session PS*10 Exploring the Four Orders of Nature*

Lecture **21** : Realizing Existence as Co-existence at All Levels

Lecture **22** : The Holistic Perception of Harmony in Existence

Tutorial 11 : Practice Session PS *11Exploring Co-existence in Existence*

Expected outcome:

The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them. They are also able to see that human being s are not fulfilling to other orders today and need to take appropriate steps to ensure right participation (in terms of nurturing, protection and right utilization) in the nature.

The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in

the nature, and point out how different courses of study relate to the different units and levels. Also they are able to make out how these courses can be made appropriate and holistic.

Module 5	Implications of the Holistic Understanding – a Look at Professional Ethics	**6**	**3**

Lecture **23**	:	Natural Acceptance of Human Values
Lecture **24**	:	Definitiveness of (Ethical) Human Conduct
Tutorial 12	:	Practice Session PS *12* ***:*** *Exploring Ethical Human Conduct*
Lecture **25**	:	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture **26**	:	Competence in Professional Ethics
Tutorial 13	:	Practice Session PS*13* ***:*** *Exploring Humanistic Models in Education*
Lecture **27**	:	Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture **28**	:	Strategies for Transition towards Value-based Life and Profession
Tutorial 14	:	Practice Session PS *14* ***:*** *Exploring Steps of Transition towards Universal Human Order*

Expected outcome:

The students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.

The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/Management/any other area of study to ensure mutual fulfilment. E.g. mutually enriching production system with rest of nature.

The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for the happy and prosperous family and society.

Guidelines and Content for Practice Sessions (Tutorials)

In order to connect the content of the proposals with practice (living), 14 practice sessions have been designed. The full set of practice sessions is available in the Teacher's Manual as well as the website.

Practice Sessions for Module 1 – Introduction to Value Education

PS 1 : Sharing about Oneself

PS 2 : Exploring Human Consciousness

PS 3 : Exploring Natural Acceptance

Practice Sessions for Module 2 – Harmony in the Human Being

PS 4 : Exploring the difference of Needs of Self and Body

PS 5 : Exploring Sources of Imagination in the Self

PS 6 : Exploring Harmony of Self with the Body

Practice Sessions for Module 3 – Harmony in the Family and Society

PS 7 : Exploring the Feeling of Trust

As an example, PS7 is a practice session in module 3 regarding trust. It is explained below:

PS 7: Form small groups in the class and in that group initiate dialogue and ask the eight questions related to trust. The eight questions are:

1a. Do I want to make myself happy?	1b. Am I able to make myself always happy?
2a. Do I want to make the other happy?	2b. Am I able to make the other always happy?
3a. Does the other want to make him happy?	3b. Is the other able to make him always happy?
4a. Does the other want to make me happy?	4b. Is the other able to make me always happy?
Intention (Natural Acceptance)	Competence
What is the answer?	What is the answer?

Let each student answer the questions for himself and everyone else. Discuss the difference between intention and competence. Observe whether you evaluate your intention and competence as well as the others' intention and competence.

Expected outcome of PS 7: The students are able to see that the first four questions are related to our Natural Acceptance i.e. intention and the next four to our Competence. They are able to note that the intention is always correct, only competence is lacking! We generally evaluate ourselves on the basis of our intention and others on the basis of their competence! We seldom look at our competence and others' intention, as a result we conclude that I am a good person and other is a bad person.

PS 8 : Exploring the Feeling of Respect

PS 9 : Exploring Systems to fulfil Human Goal

Practice Sessions for Module 4 – Harmony in the Nature (Existence)

PS 10 : Exploring the Four Orders of Nature

PS 11 : Exploring Co-existence in Existence

Practice Sessions for Module 5 – Implications of the Holistic Understanding – a Look at Professional Ethics

PS 12 : Exploring Ethical Human Conduct

PS 13 : Exploring Humanistic Models in Education

PS 14 : Exploring Steps of Transition towards Universal Human Order

L	T	P	Total
30	15	0	45

READINGS

Text Book and Teachers Manual

a. The Textbook

A Foundation Course in Human Values and Professional Ethics, R R Gaur, RAsthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN978-93-87034-47-1

b. The Teacher's Manual

Teachers' Manual for *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, NewDelhi, 2019.ISBN978-93-87034-53-2

Reference Books

1. Jeevan Vidya:EkParichaya, A Nagaraj, Jeevan VidyaPrakashan,Amarkantak,1999.

2. Human Values, A.N. Tripathi, NewAge Intl.Publishers, NewDelhi,2004

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth-by Mohandas Karam chand Gandhi
5. Small is Beautiful -E. F Schumacher.
6. Slow is Beautiful-Cecile Andrews
7. Economy of Permanence-JC Kumarappa
8. Bharat Mein Angreji Raj –Pandit Sunderlal
9. Rediscovering India- by Dharampal
10. Hind Swarajor Indian Home Rule-by Mohandas K.Gandhi
11. India Wins Freedom-Maulana Abdul Kalam Azad
12. Vivekananda-Romain Rolland (English)
13. Gandhi-Romain Rolland(English)

Semester : III

Course Code : XCE 308

Course Name : STRENGTH OF MATERIALS LAB

Prerequisite : MECHANICS OF SOLIDS-I

L	T	P	C
0	0	1	1

C	P	A
0	3	0

L	T	P	H
0	0	2	2

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Perception about the behavior of solids under stress and strain.	Psychomotor	Respond
CO2	Calculate the forces and moments.	Psychomotor	Measure
CO3	Predict the properties of surfaces of solids.	Psychomotor	Measure
CO4	Behaviour of beams under different loading systems.	Psychomotor	Measure

CO5 Calculate the deflection of springs. Psychomotor Respond

COURSE CONTENT

1.Tension test on HYSD bar / MS rod

2. Impact Test (Izod and Charpy)

3. Hardness Test (Brinell and Rockwell)

4. Test on timber

i) Compressive strength test

ii)Tensile strength test

iii)Shear Strength test

iv) Static bending test

5. Deflection Test

6. Young's modulus of the given material (steel or wood)

7. Tests on springs.

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Egor P Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2012, Second Edition.
2. Srinath L.S, "Advanced Mechanics of Solids", Tata McGraw-Hill Publishing Co., New Delhi, 2009, Third Edition.
3. William Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, McGraw-Hill International Edition, 2011.

REFERENCE BOOKS

1. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.

2. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.

3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, Pearson Prentice Hall, 2004

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3		1	3						2		2	

CO 2	1	3				2					2		2	
CO 3	1	2	2	1			1	1			2		1	
CO 4	1	2	2	1			1	1			2		1	
CO 5	1	2												
Total	**6**	**12**	**4**	**3**	**3**	**2**	**2**	**2**			**8**		**6**	
Scaled Value	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**1**			**2**		**2**	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**IV**
Subject Name	**PROBABILITY AND STATISTICS**
Subject Code	**XMA 401**
Prerequisite	Algebra , Calculus and Laplace Transforms

L	**T**	**P**	**C**	**C**	**P**	**A**	**L**	**T**	**P**	**H**
3	**0**	**0**	**3**	**2**	**0.5**	**0.5**	**3**	**0**	**0**	**3**

Course Objectives

1. Appreciate the importance of probability and statistics in computing and research
2. Develop skills in presenting quantitative data using appropriate diagrams, tabulations and summaries
3. Use appropriate statistical method in the analysis of simple datasets.
4. Interpret and clearly present output from statistical analyses in a clear concise and understandable manner
5. The main objective of this course is to provide students with the foundations of probabilities and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction and computer networks etc.

Course Outcome: After the completion of the course, students will be able to		***Domain C or P or A***	***Level***
CO1	**Explain** conditional probability, independent events; **find** expected values and Moments of Discrete random variables with their properties.	Cognitive	Understanding Remembering
CO2	**Find** distribution function, Marginal density function, conditional density function and to **define** density function of conditional distribution functions normal, exponential and gamma distributions.	Cognitive	Remembering

CO3	**Determine** the statistical parameters of Binomial, Poisson and Normal and to find correlation, regression and Rank Correlation coefficient of two variables.	Cognitive	Understanding
CO4	**Explain** large sample test for single proportion, difference of proportion, single mean, difference of means and difference of standard deviations with simple problems.	Cognitive	Understanding
CO5	**Explain** small sample test for single mean, difference of mean and correlation coefficients, variance test, chi square test with simple problems.	Cognitive	Understanding

COURSE CONTENT

UNIT I: : **Basic Probability**	**9**
Probability spaces, conditional probability, independence, Discrete random variables, Independent random variables, Poisson approximation to the binomial distribution, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum.	
UNIT II: Continuous Probability Distributions & Bivariate Distributions	**9**
Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. Bivariate distributions and their properties, conditional densities.	
UNIT III: Basic Statistics	**9**
Probability distributions: Binomial, Poisson and normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.	
UNIT IV: Test for Large Sample	**9**
Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	
UNIT V: Test for Small Sample	**9**
Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.	

L	**T**	**P**	**Total**
45	**0**	**0**	**45**

TEXT BOOKS

1. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 43rd Edition, 2015.
2. N.P. Bali and M. Goyal, “A text book of Engineering Mathematics”, Laxmi Publications, 2010.
3. Veerarajan T., “Probability, Statistics and Random processes”, Tata McGraw-Hill, New Delhi,2010.

REFERENCES

1. P. G. Hoel, S. C. Port and C. J. Stone, “Introduction to Probability Theory”, Universal Book Stall, 2003.
2. S. Ross, “A First Course in Probability”, Pearson Education India, 2002.
3. W. Feller, “An Introduction to Probability Theory and its Applications”, Vol. 1, Wiley, 1968.
4. E. Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons, 2006.

E-REFERENCES

NPTEL : Probability and Statistics by Prof.Someshkumar, Department of Mathematics, IIT Kharagpur. (http://nptel.ac.in/noc/noc_courselist.php)

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3	2	1						1	1		1
CO 2	3	2	1						1	1		1
CO 3	3	2	1	1					1	1		1
CO 4	3	2	1	1	1	1			1	1	1	1
CO 5	3	2	1	1	1	1	1		1	1	1	1
Total	15	10	5	3	2	2	1		5	5	2	5
Scaled Value	3	2	1	1	1	1	1		1	1	1	1

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : IV

Course Code : XCE 402

Course Name : MECHANICS OF SOLIDS-II

Prerequisite : MECHANICS OF SOLIDS-I

L	T	P	C
2	1	0	3

C	P	A
2.5	0	0.5

L	T	P	H
2	2	0	4

Course Outcome: After the completion of the course, students will be able to

Domain C or P or A **Level**

CO1	Determine the deflection of Simple and Curved members	Cognitive	Analyse
CO2	Analyse indeterminate structures for shear force and bending moment.	Cognitive& Affective	Analyzing & Respond
CO3	Discuss the failure criteria of the column and cylinder based on end condition	Cognitive& Affective	Understanding & Respond
CO4	Compute the deflection of beams by energy principles	Cognitive& Affective	Application & Receive
CO5	Analyse the degrees of freedom for static and kinematic frames.	Cognitive	Analyse

COURSE CONTENT

UNIT I	**DEFLECTIONS OF BEAMS**	**9**

Introduction, Equation of Elastic Curve, Methods for Determining Deflections (Double Integration, Macaulay's Method, Moment-Area Method). Strain energy and dummy unit load approaches to deflection of Simple and Curved members.

UNIT II	**INDETERMINATE BEAMS**	**9**

Propped cantilever and fixed beams-fixed end moments and reactions– Theorem of Three Moments – Shear force and Bending moment diagrams for continuous beams.

UNIT III	**COLUMNS AND THICK CYLINDERS**	**9**

Introduction – Short and Long Columns, Euler's Theory, Rankine-Gordon Formula, Eccentrically Loaded Columns - Thick cylinders – compound cylinders.

UNIT IV	**ENERGY PRINCIPLES**	**9**

Castigliano's theorems – principle of virtual work – Maxwell's reciprocal theorems.- application of energy theorems for computing deflections in beams and trusses.

UNIT V	**INDETERMINATE BEAMS AND FRAMES**	**9**

Degree of static and kinematic indeterminacies for beams and plane frames - analysis of indeterminate pin-jointed frames - rigid frames.

L	**T**	**P**	**Total**
45	**0**	**0**	**45**

TEXT BOOKS

1 .Dr. R.K.Bansal," Strength of Materials", Laxmi Publications Pvt Ltd, New Delhi, 8th Edition

2. R.K. Rajput, " Strength of Materials", S.Chand and Company Ltd, New Delhi, 8th Edition

3. R.S. Khurmi, "Strength of Materials", S. Chand & Company Ltd, New Delhi, 2013

REFERENCE BOOKS

1. William Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, McGraw-Hill International Edition.

4. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi

5. Egor P Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2012, Second Edition.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1					1			1					
CO 2	2	1				1		1			1		3	
CO 3	1				1		1				1			
CO 4	3	1		3			1						1	
CO 5	3	3											1	
Total	10	5	0	3	1	2	2	1	1	0	2	0	5	0
Scaled Value	**2**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**		**1**		**1**	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : IV

Course Code :

Course Name : DISASTER MANAGEMENT

Prerequisite : NIL

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Understand the concepts of disasters, their significance and types	Cognitive	Understand
CO2	Understand the relationship between vulnerability, disasters, disaster prevention and risk reduction	Cognitive	Understand
CO3	Able to understanding of preliminary approaches of Disaster Risk Reduction (DRR)	Cognitive	Understand
CO4	Develop awareness of institutional processes in the country	Cognitive	Application
CO5	Develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity	Cognitive	Application

COURSE CONTENT

UNIT I	**INTRODUCTION TO DISASTERS**	**6**
	Importance &Significance, Types of Disasters, Climate Change, DM cycle	
UNIT II	**RISK ASSESSMENT**	**12**
	Risk, Vulnerability, Types of Risk, Risk identification, Emerging Risks, Risk Assessment, Damage Assessment, Risk modeling.	
UNIT III	**DISASTER MANAGEMENT**	**10**
	Phases, Cycle of Disaster Management, Institutional Framework, Incident Command System, DM Plan, Community Based DM, Community health and safety, Early Warning and Disaster Monitoring, Disaster Communication, Role of GIS and Remote Sensing, Do's and Don'ts in various disasters.	
UNIT IV	**DISASTER RISK MANAGEMENT IN INDIA**	**10**
	Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness), Disaster Management Act and Policy – Other related policies, plans, programmes and legislation	
UNIT V	**DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES**	**7**
	Landslide Hazard Zonation, Earthquake Vulnerability Assessment of Buildings and Infrastructure, Drought Assessment, Coastal Flooding, Forest Fire, Man Made disasters, Space Based Inputs for Disaster Mitigation and Management, Cast Study	

L	**T**	**P**	**Total**

45	0	0	45

TEXT BOOKS

1. Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361)
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010

REFERENCE BOOKS

1. Siddhartha Gautam and K Leelakrisha Rao, "Disaster Management Programmes and Policies", Vista International Pub House, 2012
2. Arun Kumar, "Global Disaster Management", SBS Publishers, 2008
3. Pardeep Sahni, Alka Dhameja and Uma medury, "Disaster mitigation: Experiences and reflections", PHI, 2000
4. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
5. Government of India, National Disaster Management Policy, 2009

E-REFERENCES

- NIDM Publications at http://nidm.gov.in- Official Website of National Institute of Disaster Management (NIDM), Ministry of Home Affairs, Government of India
- http://cwc.gov.in , http://ekdrm.net , http://www.emdat.be , http://www.nws.noaa.gov , http://pubs.usgs.gov , http://nidm.gov.ini http://www.imd.gov.ini

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1			2	1	1		1		1		1	1		
CO 2	1	1	3	2	3		1	1						
CO 3					2		1		1					
CO 4	1	1	2	2	2		1				1	1		
CO 5	2	3		2	3		1	2	1			2		
Total	4	5	7	7	11		5	3	3		2	4		
Scaled	1	1	2	2	3		1	1	1		1	1		

Value														

Note:					
	Total	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : V

Course Code : XCE 502

Course Name : TRANSPORTATION ENGINEERING

Prerequisite : NIL

L	T	P	C
2	1	0	3

C	P	A
2	0.5	0.5

L	T	P	H
2	1	0	3

Course Objectives

- To understand the importance of transportation and characteristics, the history of highway development, surveys and classification of roads
- To study about the geometric design of highways, traffic characteristics and design of intersections, the pavement materials and design
- To know about the basics and design of various components of railway engineering, the types and functions of track, junctions and railway stations
- To learn about the aircraft characteristics, planning and components of airport
- To study about the types and components of docks and harbours
- To know about various urban transportation systems and Intelligent Transportation Systems

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	***Carryout*** surveys involved in planning and highway alignment, ***design*** cross section elements, sight distance, horizontal and vertical alignment	Cognitive & Affective Psychomotor	Remembering Respond & Observation
CO2	***Implement*** traffic studies, traffic regulations and control, and intersection design determine the characteristics of pavement materials design flexible and rigid pavements as per IRC	Cognitive Psychomotor	Analyzing Observation
CO3	***Carry out*** the surveys for railways, airports and harbours	Cognitive,	Application

		Affective & Psychomotor	Respond to Phenomena Manipulation
CO4	***Plan*** the layout of different types of terminals	Cognitive & Affective	Understanding Manipulation
CO5	***Demonstrate*** the fundamentals of Intelligent Transportation Systems	Cognitive & Psychomotor	Remembering Observation

COURSE CONTENT

UNIT I	**INTRODUCTION**	**9**

Importance of transportation, different modes of transportation, characteristics of road transport, scope of highway and traffic engineering Highway development and planning: Importance, classification of roads, road patterns, planning surveys; highway alignment and surveys Highway Geometric Design: Cross section elements, sight distance, design of horizontal and vertical alignment

UNIT II	**TRAFFIC ENGINEERING**	**9**

Traffic characteristics - Traffic studies-speed, volume, speed and delay, origin-destination, parking and accident studies; capacity of urban roads and highways; traffic operations-regulation and control; design of intersections- at grade and grade separated Pavement Materials and Design: Specifications and tests on pavement materials, pavement design factors, design of flexible and rigid pavements as per IRC

UNIT III	**RAILWAY ENGINEERING**	**9**

Location surveys and alignment - Permanent way - Gauges - Components - Functions and requirements - Geometric design Track Junctions-Points and crossings - types and functions - design and layout - simple problems - Railway stations and yards. Signaling and interlocking - control systems of train movements

UNIT IV	**AIRPORT ENGINEERING**	**7**

Aircraft characteristics - Airport obstructions and zoning - Runway - taxiways and aprons- Terminal area planning

UNIT V	**DOCKS AND HARBOURS AND URBAN TRANSPORTATION SYSTEMS**	**11**

Types - Layout and planning principles- breakwaters - docks- wharves and quays - Transit sheds- warehouses- navigation aids.

Bus transit - Mass Rapid Transit System - Light Rail Transit. Transport economics and Financing - Intelligent Transportation Systems (ITS)

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Khanna, S.K and Justo, C.E.G., Highway Engineering, Nem Chand and Bros. 2001
2. Kadiyali, Principles of Highway Engineering, Khanna Publishers, 2019
3. M.M. Agarwal, Railway Engineering, Prabha & Co. 2007.
4. Khanna, S.K. and Arora, M.G. Airport Planning and Design, Nemchand and Bros. 1999.

REFERENCE BOOKS

1. Kadiyali, L.R, Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi, 1999
2. Oza and Oza, Elements of Dock and Harbour Engineering, Charotar Publishing House, 1996.
3. Vazirani V N and Chandola S P "Transportation Engineering - Vol.2", Khanna Publishers, 1998

E-REFERENCES

1. https://nptel.ac.in/courses/105/101/105101087/
2. https://nptel.ac.in/courses/105/105/105105107/
3. https://nptel.ac.in/courses/105/104/105104098/

IS Codes

1. IRC and IRC SP codes and manuals

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	1		1		1		2		1		1	2	1
CO 2	1	2	1	1		2		2		1		1	1	2
CO 3	1	2	1	1		1		2		1	1	1	2	1
CO 4	2	2	1	1	1	2		1		1	1	1	2	2
CO 5	1	3	1	1	1	1	2	2	3	1	1	1	1	1
Total	8	10	4	5	2	7	2	9	3	5	3	5	8	7

Scaled Value

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3

Relation	No	Low	Medium	High

Semester : V

Course Code : XCE 504

Course Name : GEOTECHNICAL ENGINEERING – II

Prerequisite : MECHANICS OF SOLIDS AND GEOTECHNICAL ENGINEERING - I

L	T	P	C
2	1	0	3

C	P	A
2	0.5	0.5

L	T	P	H
2	1	0	3

Course Objectives

- To understand the application of soil properties in stability of slope analysis, improvement of soil strength and effect of lateral earth pressure on geostructures.
- To estimate the load carrying capacity of different types of soils
- To satisfy the expectation of ability of calculating the dimensions of shallow foundations
- To know about the types, analysis and design of deep foundations, geo-environmental, geotechnical earthque engineering

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	***Identify*** and ***analyze*** different types slope failures.	Cognitive & Affective	Remembering & Analyzing
CO2	***Analyze*** earth retaining structures with different loading conditions and able to understand the soil stabilization methods	Cognitive Affective	Analyzing & Responding
CO3	***Determine*** the safe bearing capacity of different soils. ***Calculate*** the size and shape of foundation required for actual loading from structures.	Cognitive, Affective & Psychomotor	Applyzing & Manipulating
CO4	***Demonstrate*** the failure modes of piles, piers and caissons	Cognitive & Psychomotor	Understanding & Manipulating
CO5	***Understand*** the effect of soil pollution and soil dynamics on foundation performance	Cognitive & Affective	Remembering Analyzing

COURSE CONTENT

UNIT I STABILITY OF SLOPES 8

Classifications of slopes, Stability analysis of infinite slopes. Stability analysis of finite slopes by Swedish and Friction circle method.

Stability analysis by Taylor's stability number, Taylor stability number

curves. Stability of slopes of earthen embankments under sudden draw down, steady seepage and during construction. Bishop's method of stability analysis.

UNIT II	SOIL RETAINING WALLS AND GROUND IMPROVEMENT TECHNIQUES	8

Active, passive and earth pressure at rest. Rankine's and Coulomb's theories of earth pressure. Rebhann's and Culman's graphical methods for active earth pressure for vertical and inclined back retaining walls, horizontal and inclined cohesion less back fill. Earth pressure on cantilever sheet piles Stability analysis of retaining walls.

Ground modification by vibro replacement, stone columns, preloading and prefabricated drains, Reinforced earth structures, Introduction to geotextiles and geomembranes, applications of geotextiles, design methods using geotextiles, geogrids, geonets, geomembranes, geotubes, grouting, deep mixing, PVDs, vacuum consolidation.

UNIT III	BEARING CAPACITY OF SOIL AND SHALLOW FOUNDATIONS	10

Methods of estimation of bearing capacity, effect of water table on bearing capacity, Terzaghi, Vesic, Hansen, Moyerhof's analysis, Bearing capacity of stratified soils. IS code recommendations for minimum depth, factor of safety, design for local shear and general shear failure. Methods of estimation of settlement of footings. Limits of settlements for various structures, Methods of finding out bearing capacity from plate load test, standard penetration test data. Collapsible soil; Identification, Collapse settlement: foundation design. Behaviour of expansive soil, foundation practices, underreamed piles. Methods of finding out load carrying capacity of under reamed piles in clayey and sandy soil. Provision of IS 2911 Part III-1980 for design of under-reamed pile foundations.

UNIT IV	DEEP FOUNDATIONS AND MACHINE FOUNDATIONS	10

Philosophy of deep foundation, piles - classification, estimation of individual and group capacity, static and dynamic approaches, pile load test, settlement of pile and pile groups, negative skin friction. piers, caissons or well foundation – analysis, tilting and corrections, Cofferdams – construction, use.

Machine foundations; introduction, machine vibration, structural design of foundation to rotary machines, impact machines, vibration characteristics, design consideration of foundation to impact machine, grillage, pile and raft foundation.

UNIT V	ENVIRONMENTAL GEOTECHNOLOGY AND EARTHQUAKE GEOTECHNOLOGY	9

A consideration of technical and scientific aspects of key geo-societal issues. Case studies and analysis of current and historic databases will be used to illustrate topics including impact of climate change, energy resources, water and soil pollution, and health risks posed by heavy metals and emerging pollutants. Sanitary land fills, settlement of sanitary land fill.

Introduction to soil dynamics, Different methods of analysis for earthquake conditions - Pseudo-static method of design - Effect of earthquake forces on various foundations,

Liquefaction, Tsunami, soil behavior during earthquake – foundation settlement and land sliding during earthquake – remedial measures.

Application of Remote Sensing, GIS and GPS in contaminated soil mapping and other geotechnical study

L	T	P	Total
30	15	0	45

TEXT BOOKS

1. Murthy, V. N. S. "Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering", CRC Press, 2002
2. Purushothama Raj, P. Ground Improvement Techniques, Laxmi Publications. 2016
3. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 3rd edition, 2005, Reprint 2011.
4. Punmia. B.C.,Asok Kumar Jain and Arun Kumar Jain, "Soil Mechanics and Foundations" Laxmi Publications Pvt. Ltd., New Delhi, Sixteenth edi.tion,2005

REFERENCE BOOKS

1. Terzaghi, K., Peck, R. B. &Mesri, G., "Soil Mechanics in Engineering Practice", Wiley, 1996.
2. Craig, R.F. "Craig's Soil Mechanics", 7th Ed., Spon Press, 2004.
3. Holtz, R.D. & Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice Hall, 1981.
4. Lambe, T.W. & Whitman, R.V., "Soil Mechanics", John Wiley & Sons, 1979.
5. Mitchell, J.K. & Soga, K., "Fundamentals of Soil Behaviour", John Wiley & Sons, 2005.
6. Coduto, D.P. "Geotechnical Engineering: Principles and Practices", Pearson Education, Prentice Hall, 2007.
7. Jie Han, "Principles and Practice of Ground Improvement", John Wiley & Sons, 2020
8. Das, B.M. "Principles of Geotechnical Engineering", Thomson Books, 2013.

E-REFERENCES

1. https://nptel.ac.in
2. https://nptel.ac.in/courses/105/101/105101201/
3. http://www.nitttrchd.ac.in/sitenew1/civil/civil.php#page=page-1

IS Codes

1. IS : 2974 (Part I to V) code of practice for different types of machine foundation
2. IS : 6403 – 2016 – Code of practice for shallow foundation
3. IS : 1904 – 2002 – Code of practice for design and construction of foundation
4. IS : 2911 – 20016 – Code of practice for design and construction of pile
5. IRC – 78 – 2000 – Code of practice for road bridges and specifications

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1	1		1		1		1		1		1	1	2
CO 2	2	1	1	1		1		2		1		1	2	2
CO 3	1	1	2	1	1	1		3		2	1	1	1	2
CO 4	1	1	1	1	1	1		1		1	1	1	2	2
CO 5	2	2	1	1	1	1	1	3	3	1	1	1	2	2
Total	7	6	5	5	3	5	1	10	3	6	3	5	8	10

Scaled Value

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : V

Course Code : XCE506

Course Name : CONCRETE AND HIGHWAY LAB

Prerequisite : TRANSPORTATION ENGINEERING

L	T	P	C
0	0	3	3

C	P	A
2	0.5	0.5

L	T	P	H
0	0	3	6

Course Objectives

- To understand the handling of equipments
- To provide the hands on training in determination of properties of pavement materials
- To provide the knowledge on the use of experimental results pertaining to pavement design

Course Outcome: After the completion of the course, students will be able to		**Domain or P or A**	**C Level**
CO1	***Identify*** and ***analyze*** various types of pavement materials	Psychomotor	Remembering & Observation
CO2	***Determine*** the necessary properties of pavement materials	Psychomotor	Analyzing Respond to Phenomena

			Observation
CO3	***Investigate*** the appropriate methods and equipments.	Psychomotor	Remembering Observation

COURSE CONTENT

Experiments in Transportation Engineering	**30**

Tests on Aggregates

- CBR test.
- Aggregate crushing value test.
- Los Angeles abrasion value test of aggregates.
- Aggregate impact value test.
- Shape test of aggregates - Flakiness Index
- Specific gravity and water absorption test for coarse aggregates.
- Fineness modulus

Tests on Bituminous Materials

- Softening point (Ring and ball test) of bitumen.
- Penetration value test of bitumen.
- Marshall Stability test.
- Specific gravity.
- Loss on heating
- Design of B C mix
- Binder content

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. “Highway Engineering”, Nemchand Publishers, 2014.
2. Subramanian K.P., “Highways, Railways, Airport and Harbour Engineering”, Scitech Publications (India), Chennai, 2010
3. Kadiyali.L.R. “Principles and Practice of Highway Engineering”, Khanna Technical Publications, 8th edition Delhi, 2013.

REFERENCE BOOKS

1. Highway Materials and Pavement Testing, Nem Chand and Bros., Roorkee, Revised Fifth Edition, 2009
2. Mix Design Methods Asphalt Institute Manual Series No. 2, Sixth Edition,1997, Lexington, KY, USA

E-REFERENCES

1. https://www.vlab.co.in/ba-nptel-labs-civil-engineering

IS Codes

1. Methods for testing tar and bituminous materials, IS 1201-1978 to IS 1220- 1978, Bureau of Indian Standards
2. Methods of test for aggregates, IS 2386 – 1978, Bureau of Indian Standards

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2				3			1				1	1	1
CO 2	2				3			1				1	1	1
CO 3	2				3			1	1	1		1	1	1
Total	6				9			3	1	1		3	3	3

Scaled Value

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : VI

Course Code : XCE602

Course Name : DESIGN OF STEEL STRUCTURES

Prerequisite : MECHANICS OF SOLIDS

L	T	P	C
3	1		4

C	P	A
2	1	0

L	T	P	H
3	2		5

Course Objectives

To understand the provisions of IS800-2007 code of practice for the design of structural members using various connections and cross-sections.

To study the behavior and design of compression, tension members and flexural members using simple and built-up sections.

To study the design of bolted and welded connections.

Course Outcome: After the completion of the course, students will **Domain C Level**

be able to		**or P or A**	
CO1	Design of structural connections	Cognitive	Understand
CO2	Design of tension	Cognitive & Affective	Analyse & Apply
CO3	Design of compression members	Cognitive	Understand
CO4	Understand fabrication of plate girders and gantry girders	Cognitive	Understand
CO5	Design of structural elements of Industrial Structures.	Cognitive	Understand

COURSE CONTENT

UNIT I	**CONNECTIONS**	**9**
	Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using welding, bolting – Design of bolted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts	
UNIT II	**TENSION MEMBERS**	**9**
	Types of sections – Net area – Net effective sections for Angles and Tee – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag	
UNIT III	**COMPRESSION MEMBERS**	**9**
	Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base	
UNIT IV	**BEAMS**	**9**
	Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders– Intermediate and bearing stiffeners – Web splices – Design of beam columns	
UNIT V	**TRUSSES AND INDUSTRIAL STRUCTURES**	**9**
	Roof trusses – Roof and side coverings - Design loads - Design of purlin and elements of truss- Design of gantry girder	

L	**T**	**P**	**Total**
45	**0**	**0**	**45**

TEXT BOOKS

1. N.Subramaniayan , “Design of Steel Structures: Theory and Practice” , Oxford University Press, 2010.
2. S.S Bhavikatti, “Design of Steel Structures”, I.K International Publishing Houses Pvt. Ltd, 2012.
3. Ramachandra S., “Design of Steel Structures – Vol. I & II”, Standard Publication, New Delhi,2010

REFERENCE BOOKS

1. Duggal S.K., “Limit state Design of Steel Structures”, 2nd edition, Tata McGraw - Hill Education, 2014
2. Dayaratnam, P., “Design of Steel Structures”, A.H.Wheeler& Co. Ltd., Allahabad, 2008
3. Jack C. McCormac , Stephen F.Csernak , “Structural Steel Design”Prentice Hall, Jul 2011

IS Codes

1. IS 800 -2007, General Construction in Steel, Code of Practice.
2. SP6 – 1 : ISI Hand Book of Structural Engineers, Part -I

Mapping of CO with PO’s

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	1	3	2			1	1	1				2	
CO 2	2	1	3	2			1		1				2	
CO 3	1	1	3	1		1							1	
CO 4	3	1	3	3	1	1							2	
CO 5	2	1	2	1		1							2	
Total	10	5	15	9	1	3	2	1	2				9	
Scaled Value	**2**	**1**	**3**	**2**	**1**	**1**	**1**	**1**	**1**				**2**	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : VII

Course Code : XCE701

Course Name : FINITE ELEMENT METHOD

Prerequisite : STRUCTURAL ANALYSIS

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Gain knowledge on basic concepts of FEM	Cognitive	Understand
CO2	Determine stresses and displacements for one and two dimensional elements under various loading.	Cognitive	Understand
CO3	Analyse the higher order elements using Isoparametric mapping and numerical integration.	Cognitive	Analyse
CO4	Identify and Apply concepts of FEM in fluid mechanics.	Cognitive	Apply

COURSE CONTENT

UNIT I	**INTRODUCTION – VARIATIONAL FORMULATION**	**9**
	Methods of Engineering analysis – Basic concept of FEM and its procedure- Advantages and Disadvantages - Weighted Residual Method – Principle of Stationary Total Potential – Rayleigh Ritz method.	
UNIT II	**ONE DIMENSIONAL FINITE ELEMENT ANALYSIS**	**9**
	Finite element: modelling, coordinates, shape functions, stiffness matrix, stiffness equation, finite element equation for onedimensional element. Load or force vector – Temperature effects.	
UNIT III	**TWO DIMENSIONAL FINITE ELEMENT ANALYSIS**	**9**
	Finite element modelling, coordinates, shape functions, stiffness matrix, stiffness equation, finite element equation for two dimensional elements. Plane stress and plane strain – Constant Strain Triangular element – Linear Strain Triangular elements - Temperature effects.	
UNIT IV	**ISOPARAMETRIC ELEMENTS AND FORMULATION**	**9**
	Shape function for 4 noded elements using natural coordinate system and transformation – element stiffness matrix equations –Higher order two dimensional element – Shape function derivation for rectangular and triangular element – Lagrangean and Serendipity elements.	
UNIT V	**APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSION**	**9**
	Heat Transfer – Application to Heat Transfer in two dimensions – Application to Fluid Mechanics in two dimensions.	

L	T	P	T
45	0	0	45

TEXT BOOKS

1. **Krishnamoorthy,C.S.,"Finite Element Analysis –Theory and Programming", Second Edition,TataMcGraw Hill, 2015.**
2. **Bhavikati , S.S., "Finite Element Analysis ", New Age International Publishjers , 2016.**
3. **S.S.Rao, "The Finite Element Method in Engineering", Pergaman Press, 2011.**

REFERENCES

1. **J.N.Reddy, "An Introduction to Finite Element Method", McGraw-Hill, Intl.Student**
2. **Edition, 2013.**
3. **Chandrupatla, T.R., and Belegundu, A.D., "Introduction to Finite Element in Engineering", Third Edition, Prentice Hall, India, 2012.**
4. O. C. Zienkiewicz, Robert Leroy Taylor, PerumalNithiarasu, "The Finite Element Method for Fluid Dynamics", Butterworth-Heinemann, 2013.

Mapping of CO's with PO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	1	3	2			1							1	1
CO2	2	2	3	1		1							1	
CO3	3	1	1	1		2				2		1	1	1
CO4	3	2	1		1	1	1	1	1	1	1			
Total	9	8	7	2	1	5	1	1	1	3	1	1	3	2
Scaled Value	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : **VII**

Course Code : **XCE703**

Course Name : **COMPUTER AIDED DESIGN & DRAFTING**

Prerequisite : **COMPUTER AIDED CIVIL ENGINEERING DRAWING**

L	T	P	C
0	0	1	1

C	P	A
0	3	0

L	T	P	H
0	0	2	2

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	To select the appropriate Structural system for a conventional reinforced concrete Structure	Psychomotor	Respond
CO2	Determine the preliminary designs of structures assuming preliminary dimensions	Psychomotor	Respond
CO3	Apply the fundaments of reinforced concrete to design structures like retaining walls, water tanks, staircase, and other structures of importance.	Psychomotor	Respond
CO4	Understand fabrication of plate girders and gantry girders	Psychomotor	Respond
CO5	Design of structural elements of Industrial Structures.	Psychomotor	Respond

COURSE CONTENT

Detailed design and drawing of the following reinforced concrete structures and steel structures using software packages like Auto CAD /Revit and Staad Pro / Etabs.

1. Design of Raft and Pile with pile cap (Four Piles only) Foundations and reinforcement details.
2. Design and Drawing of RCC cantilever and counterfort type retaining walls with reinforcement details.
3. Detailing and Drafting of Solid slab and RCC Tee beam bridges for IRC loading and reinforcement details.
4. Design and Drawing of staircase.
5. Detailing and Drafting of Circular and Rectangular Water Tank .
6. Design of plate girder bridge – Detailed Drawings including connections.
7. Design of Gantry girder– Detailed Drawings including connections.
8. Design of Roof Truss – Detailed Drawings including Connections.

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2007.

2. Devadas Menon & Unnikrishnan Pillai, Reinforced Concrete Design, Tata McGraw-Hill Publishing Company Ltd., New Delhi 2011

3. Ramachandra S., "Design of Steel Structures – Vol. I & II", Standard Publication, New Delhi,2010

REFERENCE BOOKS

1. Dr.P.Purushothaman, Reinforced Concrete Structures, Oxford Publication (P) Ltd, Delhi, 2007.

2. Krishnamurthy, D., "Structural Design & Drawing – Vol. II", CBS Publishers & Distributors.

3. Duggal S.K.,"Limit state Design of Steel Structures", 2nd edition, Tata McGraw Hill, 2014.

IS CODES:

1. IS 456 -2000, Plain and Reinforced Concrete – Code of Practice, 4th revision

2.SP16-1980, SP6 – 1 : ISI Hand Book of Structural Engineers, Part -I

3. IS 800 -2007, General Construction in Steel, Code of Practice.

Mapping of CO with PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	3		1										2	
CO2	2	3		1		1	1						3	1
CO3	1	1	3	1		1	1	1			1		1	
CO4	1	1	3	1		1							1	
CO5	3	1	3	3	1	1							2	
Total	**10**	**6**	**10**	**6**	**1**	**4**	**2**	**1**	**1**		**1**		**9**	**1**
Scaled Value	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**		**1**		**2**	**1**

1 – Low, 2 – Medium, 3 – High

Note:	Total	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester :

Course Code : XCEE01

Course Name : Smart Structures and Materials

Prerequisite :

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Study about the smart materials and its characteristics	Cognitive	Understand
CO2	Evaluate the measurement techniques for strain	Cognitive	Understand
CO3	Design of sensors using smart materials	Cognitive	Understand
CO4	Design of actuators using smart materials	Cognitive	Understand
CO5	Energy harvesting using piezoelectric materials	Cognitive	Understand

COURSE CONTENT

UNIT I INTRODUCTION 9

Introduction to Smart Materials and Structures – Instrumented structures functions and response –Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT II MEASURING TECHNIQUES 9

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT III SENSORS 9

Sensing Technology – Types of Sensors – Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT IV	ACTUATORS	9

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magneto structure Material – Shape Memory Alloys – Electro orheological Fluids– Electro magnetic actuation – Role of actuators and Actuator Materials.

UNIT V	ADVANCES IN SMART STRUCTURES & MATERIALS	9

Self-Sensing Piezoelectric Transducers, Energy Harvesting Materials, Autophagous Materials, Self-Healing Polymers, Intelligent System Design, Emergent System Design

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Brain Culshaw – Smart Structure and Materials Artech House – Borton. London.
2. Smart Materials and Structures/ M. V. Gandhi and B.So Thompson/ Chapman & Hall, London; New York.
3. Gauenzi, P., Smart Structures, Wiley, 2009
4. Michelle Addington and Daniel L. Schodek, "Smart Materials and Technologies: For the Architecture and Design Professions", Routledge 2004.

REFERENCE BOOKS

1. Electro ceramics: Materials, Properties/ A.J. Moulson and J.M-Herbert/ Wiley/ 2nd Edition, (ISBN: 0471497479).
2. Piezoelectric Sensories: Force, Strain, Pressure, Acceleration and Acoustic Emission Sensors. Materials and Amplifiers/ G. Gautschi/ Springer, Berlin; New York,2002 (ISBN:3540422595)
3. L. S. Srinath, "Experimental Stress Analysis", Tata McGraw-Hill, 1998

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3		1	3						2		2	
CO 2	1	3				2					2		2	
CO 3	1	2	2	1			1	1			2		1	
CO 4	1	2	2	1			1	1			2		1	
CO 5	1	2												

Total	6	12	4	3	3	2	2	2			8		6	
Scaled Value	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**1**			**2**		**2**	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester :

Course Code : XCEOE2

Course Name : GIS for Civil Engineering

Prerequisite : Nil

L	**T**	**P**	**C**
3	**0**	**0**	**3**

C	**P**	**A**
1.5	**1.0**	**0.5**

L	**T**	**P**	**H**
3	**0**	**0**	**3**

Course Objectives

- To understand the basic concepts of remote sensing
- To know the applications of Geographic information systems in Civil Engineering
- To identify the basic remote sensing concepts and its characteristics
- To implement the photogrammetry concepts and fundamentals of Air photo interpretation
- To use various analysis and interpretation of GIS results

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	***Explain*** about the fundamentals of remote sensing	Cognitive Affective	Remembering Respond & Observation
CO2	***Facilitating*** complex querying and analysis	Cognitive Affective	Analyzing Observation
CO3	***Maximizing*** the efficiency of planning and decision making	Cognitive, Affective Psychomotor	Application Respond to Phenomena Manipulation

CO4	***Integrating*** information from multiple sources	Cognitive Affective Psychomotor	Understanding Manipulation Apply
CO5	***Eliminating*** redundant data and minimizing duplication and apply in civil engineering field	Cognitive Psychomotor	Remembering Observation

COURSE CONTENT

UNIT I	**INTRODUCTION TO REMOTE SENSING**	**11**

Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory - Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts - Types of platforms and sensors - Passive and Active sensors – resolution concept - Image interpretation – Image processing

UNIT II	**INTRODUCTION TO GIS AND MAPS**	**9**

History of GIS, Early Developments in GIS, Applications of GIS, Components of a GIS - Introduction – Maps and Globe – Types of map – Map scale - standard GIS software

UNIT III	**GEOREFERENCING AND MAP PROJECTION**	**6**

Understanding Earth – Georeferencing – Transformation – Coordinate System - Map projections – types of map projections – map analysis

UNIT IV	**GIS – DATA ENTRY, STORAGE AND ANALYSIS**	**10**

Spatial Database Management System – Data storage - Data Structure models – Vector and raster data – data compression – data input by digitization and scanning, data storage – attribute data analysis – integrated data analysis – Data interpolation - mapping concept - development of map overlay, overlay operation – Errors and quality control.

UNIT V	**APPLICTIONS OF GIS IN CIVIL ENGINEERING**	**9**

Web GIS - Modeling in GIS Highway alignment studies – Land Information System - Terrain Mapping and Analysis - Watershed Analysis - Environmental Engineering & Impact Studies - Wastewater and Stormwater Management - Disaster Management - Structural Engineering – Soil Mapping

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Shahab Fazal, , (2015), G I S Basics, New Age International Publications, Chennai
2. Burrough P.A. (2000), Principle of Geographical Information Systems for land resources assessment,

Clarendon Press, Oxford.

3. Anji Reddy.M. (1998), Remote Sensing and Geographical information systems.

REFERENCE BOOKS

1. Lo & Yeung (2005), Geographic Information Systems, Prentice of India.
2. Lillesand, T.M. & Kiefer R.W. (1998), Remote Sensing and image interpretation, John Wiley & Sons, Newyork.
3. Clarke Parks & Crane (2005), Geographic Information Systems & Environmental Modelling, Prentice-Hall of India.
4. Wolf Paul (1998), Elements of Photogrammetry, McGraw Hill, New Delhi.
5. Goodchild, M.F., Longley, P.A., Maguire, D. J. & Rhind, D.W 2001, *Geographic information systems and science*, John Wiley & Sons Ltd. , England.

E-REFERENCES

1. https://nptel.ac.in/courses/105/102/105102015/
2. http://webhelp.esri.com/arcgisserver/9.3/java//index.htm#wms_service.htm

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	1	1	1		1		2		1		1	2	1
CO 2	1	2	1			2		2		1		1	2	2
CO 3	3	1	1	1		1		2		1	1	1	2	1
CO 4	2	2	1	1	1	2		1		1	1	1	2	2
CO 5	1	3	1	1	1	1	2	2	3	1	1	1	1	1
Total	10	9	5	4	2	7	2	9	3	5	3	5	9	7
Scaled Value														

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3

Relation	No	Low	Medium	High

Semester

Subject Name **WATER RESOURCES ENGINEERING**

Subject Code **XCEE12**

Prerequisite **NIL**

L	T	P	C
2	2	0	3

C	P	A
2.5	0	0.5

L	T	P	H
2	2	0	4

Course Objectives

- To prepare the students for a successful career as hydrologist and water resources engineers
- To develop the ability among students to synthesis data and technical concepts for application in hydrology and water resources engineering
- To provide students an opportunity to work as a part of interdisciplinary team
- To promote student awareness of the life-long learning and to introduce them professional ethics and codes of professional practice in water resource engineering

Course Outcomes:

At the end of the course, students must be in a position to:		**Domain C or P or A**
CO1	Understand the interaction among various processes in the hydrologic cycle	C
CO2	Understand the forms of precipitation and measurements.	C
CO3	Understand runoff , ground water and well hydrology	C
CO4	Understand water requirement of crops-Crops and crop seasons in India, Methods of applying water.	C
CO5	Understand application of Distribution systems- cannel, Dams, reservoir and spillway.	C

UNIT I **INTRODUCTION** **9**

Hydrologic cycle, water-budget equation, history of hydrology, world water balance, applications in engineering, sources of data. *Precipitation* - forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth area- duration relationships, maximum

intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India

UNIT II ABSTRACTIONS FROM PRECIPITATION 9

Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration.

UNIT III RUNOFF 9

Runoff volume, SCS-CN method of estimating runoff volume, flow duration curve, flow-mass curve, hydrograph, factors affecting runoff, hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph surface water resources of India, environmental flows.*Ground water and well hydrology* - forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests

UNIT IV WATER WITHDRAWALS AND USES 9

Water for energy production, water for agriculture, water for hydroelectric generation; flood control. Analysis of surface water supply, Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

UNIT IV DISTRIBUTION SYSTEMS 9

Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. *Dams and spillways* - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

L	T	P	Total
45	0	0	45

TEXT BOOKS:

1. Subramanya. K," Engineering Hydrology", Tata Mc-Graw Hill publishing pvt. Ltd., New Delhi, 2010.

2. K N Muthreja, “Applied Hydrology”, Tata Mc-Graw Hill publishing pvt. Newdelhi
3. Larry W. Mays “Water Resources Engineering”, Wiley; 2 edition (June 8, 2010)

REFERENCE BOOKS

1. G.L. Asawa “Elementary Irrigation Engineering” New Age International Publisher (1999).
2. G. L. Asawa, “Irrigation Engineering “, John Wiley & Sons Australia, Limited, 1994.
3. J D Zimmerman “Advances in Irrigation” Elsevier, 2013.

Mapping of CO’s with PO’s:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2		3		1	1								
CO 2	3	1	3		1	1								
CO 3	2	1	3		1	1								
CO 4	2	1	3		1	1								
CO 5	2		3		1	1								
Total	11	3	15		5	5								

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester

Subject Name **TALL STRUCTURES**

Subject Code **XCEE22**

Designed by **Department of Civil Engineering**

Prerequisite **Design of Concrete Structures, Design of Steel Structure**

L	T	P	C
3	1	0	3

C	P	A
2	0	1

L	T	P	H
3	0	0	3

Preamble

This course provides the basic knowledge of the design principles and the material properties of tall buildings. The study includes the various structural behaviour of different types of frames. It also

deals with the analysis and design parameters of tall structures.

Course Objective:

1. To know the design criteria based on different loading conditions.
2. To gain knowledge about the structural behavoiur of various frames.
3. To learn about the different methods of analysis of tall structures.
4. To make the students understand about the stability factors of tall buildings.

Course Outcome:		**Domain**
On the successful completion of the course, students will be able to		
CO1	Identify the design criteria and design philosophy.	C(Understand)
CO2	Approach the design of tall buildings with static and dynamic loading.	C(Application)
CO3	Assimilate the behaviour of different types of structural systems.	C (Understand)
CO4	Analyse the members and identify the reduction techniques	C(Analyse)
CO5	Correlate the translational and torsional effects in tall buildings	C(Evaluate)

COURSE CONTENT

UNIT - I	**DESIGN CRITERIA**	**9**
	Design philosophy - Loading - sequential loading - strength and stability - stiffness and drift limitations - human comfort criteria, creep – shrinkage and temperature effects – fire – foundation, settlement and soil structures interaction.	
UNIT - II	**LOADS ON TALL BUILDINGS – CODE RECOMMENDATIONS**	**9**
	Gravity loadings: Dead load & live load – Live load reduction methods – impact load – gravity load –construction load. Wind Loading : Static & dynamic approach – Analytical & wind tunnel experimental method Earthquake Loading : Equivalent lateral force – model analysis –combination of loading	
UNIT-III	**BEHAVIOUR OF STRUCTURAL SYSTEMS**	**9**
	Rigid frames – braced frames – In filled frames – shear walls –coupled shear walls – wall frames tubular – cores & hybrid mega systems.	
UNIT -IV	**ANALYSIS AND DESIGN**	**9**
	Modeling for approximate analysis - Accurate analysis and reduction Techniques - Analysis of buildings as total structural system considering overall integrity and major subsystem interaction - Analysis for member forces - drift and twist - computerized general 3D analysis.	

UNIT - V STABILITY OF TALL BUILDING 9

Overall buckling analysis of frames - wall - frames - Approximate methods - second - order effects of gravity loading - p - Delta analysis Simultaneous first order and P-Delta analysis, Translational - Torsional instability out of plumb effects - stiffness of member instability - effect of foundation rotation.

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Dave parker, Antony wood , "The Tall Buildings-Reference Book", Routledge - Taylor & Francis group, London, 2013
2. Guy Nordenson, Terence riley, "Tall buildings", The museum of modern art, New York, 2003.
3. Bryan Stafford Smith, Alexcoull, Tall Building Structure Analysis and Design, John Wiley & Sons, 1991.

REFERENCES

1. Wolf Gang Schuller, "High Rise Building Structures", John Wiley &sons, 1977.
2. Taranath.B.S , "Structural Analysis & Design of Tall Buildings", Tata McGraw Hill, 1988.
3. Lynn, S.Beedle, "Advances in Tall Buildings", CBS Publishers, Delhi, 1986.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1		1	1	1	1		2	1	1	2	4
CO2	1		2	1	1	1	1	1		1		2	1	3
CO3	2	2	3	1	1	2		1	1				2	1
CO4	1		2	1		1	1			1	1	1	1	2
CO5	1	2	3	1		2		1		1		2	1	2
Total	6	6	11	4	3	7	3	4	1	5	2	6	7	12
Scaled Values	2	2	3	1	1	2	1	1	1	1	1	2	2	3

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester

Subject Name **PRESTRESSED AND PRE FABRICATED STRUCTURES**

Subject Code **XCEE26**

Prerequisite **DESIGN OF CONCRETE STRUCTURES**

L	T	P	H
3	0	0	3

C	P	A
2	0.5	0.5

L	T	P	H
3	0	0	3

Course Objectives

- To introduce the concept of prestressing, methods and advantages.
- Todesign the prestressed concrete structures subjected to flexure, shear, tension and compression.
- To acquire knowledge about the concept of circular prestressing and its application.

Course Outcome:		**Domain C or P or A**
CO1	Understand the need of the prestressed concrete and the methods of prestressing.	C
CO2	Identify and apply the design codes relevant for the designof prestressed concrete members	C & P
CO3	Accomplish the design calculation to predict circular prestressing behaviour of prestressed concrete structures.	A
CO4	Understand the behaviour of composite section and analyse the stress under different conditions.	C
CO5	Analyse the behaviour of statically indeterminate structures for the primary and secondary moments.	C

COURSE CONTENT

UNIT I **INTRODUCTION – THEORY AND BEHAVIOUR** **9**

Basic concepts – Advantages – Materials required – Systems and methods of prestressing –Analysis of sections by Stress concept, Strength concept and Load balancing concept - Effect of tendon profile on deflections – Factors influencing deflections – Calculation of short term and long term deflections –Losses of prestress.

UNIT II **DESIGN OF MEMBERS.** **9**

Behaviour of flexural members, determination of ultimate flexural strength – Various Codal provisions - Design for shear, bond and torsion, Design of Tension member,

Design of Compression member. Stress distribution in end block-Design of anchorage zone reinforcement.

UNIT III	CIRCULAR PRESTRESSING	9

Prestressed Concrete Pipes- Advantages, Loads - Design of cylinder and non-cylinder pipes. Prestressed Concrete Tanks-Choice of types of tanks.

UNIT IV	COMPOSITE CONSTRUCTION	9

Types of composite Construction - Analysis of stresses – Differential Shrinkage - Estimation of Deflection. Partial prestressing - its advantages and applications.

UNIT V	CONTINUOUS BEAMS	9

Analysis of continuous beams - Methods of achieving continuity - concept of linear transformations, concordant cable profile and cap cables.

L	T	P	Total
45			45

TEXT BOOKS

1. Krishna Raju. N, Prestressed Concrete, Tata McGraw Hill Publishing Co. Ltd, New Dehi, 2012
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.
3. Libby J.R., Modern Prestressed Concrete, 3e,CBS Publishers & Distributors, New Delhi, 2007

REFERENCES

1. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
2. Ramaswamy G.S., Modern prestressed concrete design, Arnold Heinimen, New Delhi.
3. David A.Sheppard, William R. and Philips, Plant Cast precast and prestressed concrete – A design guide, McGraw Hill, New Delhi,2012.

IS Codes

1. IS1343:2012, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012
2. IS 3370-3 (1967): Code of Practice Concrete structures for the storage of liquids, Part 3: Prestressed concrete structures, Bureau of Indian Standards, New Delhi, 2008
3. IS 3370-4 (1967): Code of practice for concrete structures for the storage of liquids, Part 4: Design tables, Bureau of Indian Standards, New Delhi, 2008

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1		1	1	1	1		2	1	1	2	4
CO2	1		2	1	1	1	1	1		1		2	1	3

CO3	2	2	3	1	1	2		1	1				2	1
CO4	1		2	1		1	1			1	1	1	1	2
CO5	1	2	3	1		2		1		1		2	1	2
Total	6	6	11	4	3	7	3	4	1	5	2	6	7	12
Scaled Values	2	2	3	1	1	2	1	1	1	1	1	2	2	3

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

4.b. Bachelor of Technology in Civil Engineering (Part Time) - After Revision

S.No	Description		Courses	Credits				Hours			
				L	T	P	TO	L	T	P	TO
SEMESTER I											
1.	MA-I	PCE101	Probability and statistics	3	0	0	3	3	0	0	3
2.	PCC T	PCE102	Mechanics of Solids-I	2	1	0	3	2	2	0	4
3.	PCC-T	PCE103	Fluid Mechanics and Machinery	2	1	0	3	2	2	0	4
4.	PCC-L	PCE104	Strength of Materials Lab	0	0	2	2	0	0	2	2
5.	PCC-L	PCE105	Fluid Mechanics and Machinery Lab	0	0	2	2	0	0	2	2
			Total				**13**				**15**
SEMESTER II											
1.	PCC T	PCE201	Mechanics of Solids-II	2	1	0	3	2	2	0	4
2.	PCC-T	PCE202	Geotechnical Engineering	2	1	0	3	2	2	0	4
3.	PCC-T	PCE203	Concrete Technology	3	0	0	3	3	0	0	3
4.	UMAN-I	PCE204	Disaster Management	0	0	0	0	2	0	0	2
5.	PCC-L	PCE205	Geotechnical Engineering Lab	0	0	2	2	0	0	2	2
			Total				**11**				**15**
Semester III											
1.	PCC T	PCE301	Structural Analysis	3	1	0	4	3	2	0	5
2.	PCC-T	PCE302	Transportation Engineering	3	0	0	3	3	0	0	3
3.	PCC-T	PCE303	Environmental Engineering	3	0	0	3	3	0	0	3
4.	PCC-L	PCE304	Environmental Engineering Lab	0	0	2	2	0	0	2	2
5.	PCC-L	PCE305	Concrete & Highway Lab	0	0	2	2	0	0	2	2
			Total				**14**				**15**

S.No	Description		Courses	Credits				Hours			
				L	T	P	TO	L	T	P	TO
Semester IV											
1.	PCC -T	PCE401	Design of RCC Structures	3	1	0	4	3	1	0	4
2.	PCC-T	PCE402	Geotechnical Engineering - II	2	1	0	3	2	1	0	3
3.	PCC-T	PCE403	Construction Engineering and Management	3	0	0	3	3	0	0	3
4.	PEC-I	PCEE**	Professional Elective -I	3	0	0	3	3	0	0	3
5.	PCC-L	PCE405	Construction Management Lab	0	0	2	2	0	0	2	2
			Total				**15**				**15**
SEMESTER V											
1.	PCC- T	PCE501	Design of Steel Structures	3	1	0	4	3	2	0	5
2.	PEC-II	PCEE**	Professional Elective II	3	0	0	3	3	0	0	3
3.	UMAN-V	MC	Environmental studies	0	0	0	0	2	0	0	2
4.	PCC-L	PCE504	Computer Aided Design & Drafting	0	0	2	2	0	0	3	3
5.	PCC-L	PCE505	Estimation, Costing and valuation	0	0	2	2	0	0	2	2
			Total				**11**				**15**
SEMESTER VI											
1.	PCC-T	PCE601	Finite Element Method	3	1	0	4	3	2	0	5
2.	PEC-III	PCEE**	Professional Elective –III	3	0	0	3	3	0	0	3
2.	PROJ II	PCE603	Project Work (Phase-I)	0	0	3	3	0	0	6	6
			Total				**10**				**14**
SEMESTER VII											
1.	PEC-IV	PCEE**	Professional Elective –IV	3	0	0	3	3	0	0	3
2.	PROJ II	PCE702	Project Work (Phase-II)	0	0	9	9	0	0	18	18
			Total				**12**				**21**
Total Credit - 86											

PROFESSIONAL ELECTIVE COURSE - CIVIL ENGINEERING

[PEC-CE]

Professional Elective Course I

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
PCEE01	PEC	Smart Structures and Materials	3	0	0	3
PCEE02	PEC	GIS for Civil Engineering	3	0	0	3
PCEE03	PEC	Water Quality Engineering	3	0	0	3
PCEE04	PEC	Pavement Design	3	0	0	3
PCEE05	PEC	Construction Equipment and Automation	3	0	0	3
PCEE06	PEC	Airport Planning and Design	3	0	0	3
PCEE07	PEC	Port and Harbour Engineering	3	0	0	3

Professional Elective Course II

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
PCEE08	PEC	Earthquake Engineering	3	0	0	3
PCEE09	PEC	Bridge Engineering	3	0	0	3
PCEE10	PEC	Advanced Structural Analysis	3	0	0	3
PCEE11	PEC	Basics of Computational Hydraulics	3	0	0	3
PCEE12	PEC	Water Resources Engineering	3	0	0	3
PCEE13	PEC	Environmental Geotechnology	3	0	0	3
PCEE14	PEC	Geotechnical Design	3	0	0	3

Professional Elective Course III

Sub. Code	Category	Name of the Course	Hours per week			C
			L	T	P	
PCEE15	PEC	Environmental Fluid Mechanics	3	0	0	3
PCEE16	PEC	Environmental Impact Assessment	3	0	0	3
PCEE17	PEC	Design of Hydraulic Structures	3	0	0	3
PCEE18	PEC	Surface Hydrology	3	0	0	3

PCEE19	PEC	Repairs and Rehabilitation of Structures	3	0	0	3
PCEE20	PEC	Urban Hydrology and Hydraulics	3	0	0	3
PCEE21	PEC	Building Construction Practice	3	0	0	3

Professional Elective Course IV

Sub.Code	Category	Name of the Course	Hours per week			C
			L	T	P	
PCEE22	PEC	Tall Structures				
PCEE23	PEC	Environmental Law and Policy	3	0	0	3
PCEE24	PEC	Groundwater Engineering	3	0	0	3
PCEE25	PEC	Solid and Hazardous Waste Management	3	0	0	3
PCEE26	PEC	Pre-stressed and Prefabricated Structures	3	0	0	3
PCEE27	PEC	Contracts Management	3	0	0	3
PCEE28	PEC	Air and Noise Pollution and Control	3	0	0	3

Note

L – Lecture, T – Tutorial, P – Practical, C – Credit

Semester	**I**
Subject Name	**PROBABILITY AND STATISTICS**
Subject Code	**PCE 101**
Prerequisite	**---**

L	T	P	C	C	P	A	L	T	P	H
3	0	0	3	2	0.5	0.5	3	0	0	3

Course Objectives

6. Appreciate the importance of probability and statistics in computing and research
7. Develop skills in presenting quantitative data using appropriate diagrams, tabulations and summaries
8. Use appropriate statistical method in the analysis of simple datasets.
9. Interpret and clearly present output from statistical analyses in a clear concise and understandable manner
10. The main objective of this course is to provide students with the foundations of probabilities and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction and computer networks etc.

Course Outcome: After the completion of the course, students will be able to		***Domain C or P or A***	***Level***
CO1	**Explain** conditional probability, independent events; **find** expected values and Moments of Discrete random variables with their properties.	Cognitive	Understanding Remembering
CO2	**Find** distribution function, Marginal density function, conditional density function and to **define** density function of conditional distribution functions normal, exponential and gamma distributions.	Cognitive	Remembering
CO3	**Determine** the statistical parameters of Binomial, Poisson and Normal and to find correlation, regression and Rank Correlation coefficient of two variables.	Cognitive	Understanding
CO4	**Explain** large sample test for single proportion, difference of proportion, single mean, difference of means and difference of standard deviations with simple problems.	Cognitive	Understanding
CO5	**Explain** small sample test for single mean, difference of mean and correlation coefficients, variance test, chi square test with simple problems.	Cognitive	Understanding

COURSE CONTENT

UNIT I: : Basic Probability	**9**
Probability spaces, conditional probability, independence, Discrete random variables, Independent random variables, Poisson approximation to the binomial distribution, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum.	
UNIT II: Continuous Probability Distributions & Bivariate Distributions	**9**
Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. Bivariate distributions and their properties, conditional densities.	
UNIT III: Basic Statistics	**9**
Probability distributions: Binomial, Poisson and normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.	
UNIT IV: Test for Large Sample	**9**
Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	
UNIT V: Test for Small Sample	**9**
Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.	

L	T	P	Total
45	0	0	45

TEXT BOOKS

4. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2015.
5. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2010.
6. Veerarajan T., "Probability, Statistics and Random processes", Tata McGraw-Hill, New Delhi,2010.

REFERENCES

1. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003.
5. S. Ross, "A First Course in Probability", Pearson Education India, 2002.
6. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 1968.
7. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.

E-REFERENCES

NPTEL : Probability and Statistics by Prof.Someshkumar, Department of Mathematics, IIT Kharagpur. (http://nptel.ac.in/noc/noc_courselist.php)

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3	2	1						1	1		1
CO 2	3	2	1						1	1		1
CO 3	3	2	1	1					1	1		1
CO 4	3	2	1	1	1	1			1	1	1	1
CO 5	3	2	1	1	1	1	1		1	1	1	1
Total	15	10	5	3	2	2	1		5	5	2	5
Scaled Value	3	2	1	1	1	1	1		1	1	1	1

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : I

Course Code : PCE 101

Course Name : STRENGTH OF MATERIALS LAB

Prerequisite : MECHANICS OF SOLIDS-I

L	T	P	C
0	0	1	1

C	P	A
0	3	0

L	T	P	H
0	0	2	2

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Perception about the behavior of solids under stress and strain.	Psychomotor	Respond
CO2	Calculate the forces and moments.	Psychomotor	Measure
CO3	Predict the properties of surfaces of solids.	Psychomotor	Measure
CO4	Behaviour of beams under different loading systems.	Psychomotor	Measure
CO5	Calculate the deflection of springs.	Psychomotor	Respond

COURSE CONTENT

1.Tension test on HYSD bar / MS rod

2. Impact Test (Izod and Charpy)

3. Hardness Test (Brinell and Rockwell)

4. Test on timber

i) Compressive strength test

ii)Tensile strength test

iii)Shear Strength test

iv) Static bending test

5. Deflection Test

6. Young's modulus of the given material (steel or wood)

7. Tests on springs.

L	T	P	Total
0	0	30	30

TEXT BOOKS

4. Egor P Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2012, Second Edition.
5. Srinath L.S, "Advanced Mechanics of Solids", Tata McGraw-Hill Publishing Co., New Delhi, 2009, Third Edition.
6. William Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, McGraw-Hill International Edition, 2011.

REFERENCE BOOKS

1. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.

2. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.

3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, Pearson Prentice Hall, 2004

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3		1	3						2		2	
CO 2	1	3				2					2		2	
CO 3	1	2	2	1			1	1			2		1	
CO 4	1	2	2	1			1	1			2		1	
CO 5	1	2												
Total	**6**	**12**	**4**	**3**	**3**	**2**	**2**	**2**			**8**		**6**	
Scaled Value	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**1**			**2**		**2**	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : II

Course Code : PCE 201

Course Name : MECHANICS OF SOLIDS-II

Prerequisite : MECHANICS OF SOLIDS-I

L	T	P	C
2	1	0	3

C	P	A
2.5	0	0.5

L	T	P	H
2	2	0	4

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Determine the deflection of Simple and Curved members	Cognitive	Analyse
CO2	Analyse indeterminate structures for shear force and bending moment.	Cognitive& Affective	Analyzing & Respond
CO3	Discuss the failure criteria of the column and cylinder based on end condition	Cognitive& Affective	Understanding & Respond
CO4	Compute the deflection of beams by energy principles	Cognitive& Affective	Application & Receive
CO5	Analyse the degrees of freedom for static and kinematic frames.	Cognitive	Analyse

COURSE CONTENT

UNIT I	**DEFLECTIONS OF BEAMS**	**9**
	Introduction, Equation of Elastic Curve, Methods for Determining Deflections (Double Integration, Macaulay's Method, Moment-Area Method). Strain energy and dummy unit load approaches to deflection of Simple and Curved members.	
UNIT II	**INDETERMINATE BEAMS**	**9**
	Propped cantilever and fixed beams-fixed end moments and reactions– Theorem of Three Moments – Shear force and Bending moment diagrams for continuous beams.	
UNIT III	**COLUMNS AND THICK CYLINDERS**	**9**

Introduction – Short and Long Columns, Euler's Theory, Rankine-Gordon Formula, Eccentrically Loaded Columns - Thick cylinders – compound cylinders.

UNIT IV ENERGY PRINCIPLES 9

Castigliano's theorems – principle of virtual work – Maxwell's reciprocal theorems.- application of energy theorems for computing deflections in beams and trusses.

UNIT V INDETERMINATE BEAMS AND FRAMES 9

Degree of static and kinematic indeterminacies for beams and plane frames - analysis of indeterminate pin-jointed frames - rigid frames.

L	T	P	Total
45	0	0	45

TEXT BOOKS

1 .Dr. R.K.Bansal," Strength of Materials", Laxmi Publications Pvt Ltd, New Delhi, 8th Edition

6. R.K. Rajput, " Strength of Materials", S.Chand and Company Ltd, New Delhi, 8th Edition

7. R.S. Khurmi, "Strength of Materials", S. Chand & Company Ltd, New Delhi, 2013

REFERENCE BOOKS

1. William Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, McGraw-Hill International Edition.

8. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi

9. Egor P Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2012, Second Edition.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1					1			1					
CO 2	2	1				1		1			1		3	
CO 3	1				1		1				1			
CO 4	3	1		3			1						1	
CO 5	3	3											1	
Total	10	5	0	3	1	2	2	1	1	0	2	0	5	0
Scaled Value	**2**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**		**1**		**1**	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : IV

Course Code : PCE 204

Course Name : DISASTER MANAGEMENT

Prerequisite : NIL

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

Course Outcome: After the completion of the course, students will be able to

		Domain C or P or A	**Level**
CO1	Understand the concepts of disasters, their significance and types	Cognitive	Understand
CO2	Understand the relationship between vulnerability, disasters, disaster prevention and risk reduction	Cognitive	Understand
CO3	Able to understanding of preliminary approaches of Disaster Risk Reduction (DRR)	Cognitive	Understand
CO4	Develop awareness of institutional processes in the country	Cognitive	Application
CO5	Develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity	Cognitive	Application

COURSE CONTENT

UNIT I	**INTRODUCTION TO DISASTERS**	**6**
	Importance &Significance, Types of Disasters, Climate Change, DM cycle	
UNIT II	**RISK ASSESSMENT**	**12**
	Risk, Vulnerability, Types of Risk, Risk identification, Emerging Risks, Risk Assessment, Damage Assessment, Risk modeling.	
UNIT III	**DISASTER MANAGEMENT**	**10**

Phases, Cycle of Disaster Management, Institutional Framework, Incident Command System, DM Plan, Community Based DM, Community health and safety, Early Warning and Disaster Monitoring, Disaster Communication, Role of GIS and Remote Sensing, Do's and Don'ts in various disasters.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 10

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness), Disaster Management Act and Policy – Other related policies, plans, programmes and legislation

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES 7

Landslide Hazard Zonation, Earthquake Vulnerability Assessment of Buildings and Infrastructure, Drought Assessment, Coastal Flooding, Forest Fire, Man Made disasters, Space Based Inputs for Disaster Mitigation and Management, Cast Study

L	T	P	Total
45	0	0	45

TEXT BOOKS

5. Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
6. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361)
7. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
8. KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010

REFERENCE BOOKS

6. Siddhartha Gautam and K Leelakrisha Rao, “Disaster Management Programmes and Policies”, Vista International Pub House, 2012
7. Arun Kumar, “Global Disaster Management”, SBS Publishers, 2008
8. Pardeep Sahni, Alka Dhameja and Uma medury, “Disaster mitigation: Experiences and reflections”, PHI, 2000
9. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
10. Government of India, National Disaster Management Policy, 2009

E-REFERENCES

- NIDM Publications at http://nidm.gov.in- Official Website of National Institute of Disaster Management (NIDM), Ministry of Home Affairs, Government of India
- http://cwc.gov.in , http://ekdrm.net , http://www.emdat.be , http://www.nws.noaa.gov , http://pubs.usgs.gov , http://nidm.gov.ini http://www.imd.gov.ini

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1			2	1	1		1		1		1	1		
CO 2	1	1	3	2	3		1	1						
CO 3					2		1		1					
CO 4	1	1	2	2	2		1				1	1		
CO 5	2	3		2	3		1	2	1			2		
Total	4	5	7	7	11		5	3	3		2	4		
Scaled Value	1	1	2	2	3		1	1	1		1	1		

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : III

Course Code : PCE 302

Course Name : TRANSPORTATION ENGINEERING

Prerequisite : NIL

L	T	P	C
2	1	0	3

C	P	A
2	0.5	0.5

L	T	P	H
2	1	0	3

Course Objectives

- To understand the importance of transportation and characteristics, the history of highway development, surveys and classification of roads
- To study about the geometric design of highways, traffic characteristics and design of intersections, the pavement materials and design
- To know about the basics and design of various components of railway engineering, the types and functions of track, junctions and railway stations
- To learn about the aircraft characteristics, planning and components of airport
- To study about the types and components of docks and harbours
- To know about various urban transportation systems and Intelligent Transportation Systems

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	***Carryout*** surveys involved in planning and highway alignment, ***design*** cross section elements, sight distance, horizontal and vertical alignment	Cognitive & Affective Psychomotor	Remembering Respond & Observation
CO2	***Implement*** traffic studies, traffic regulations and control, and intersection design determine the characteristics of pavement materials design flexible and rigid pavements as per IRC	Cognitive Psychomotor	Analyzing Observation
CO3	***Carry out*** the surveys for railways, airports and harbours	Cognitive, Affective & Psychomotor	Application Respond to Phenomena Manipulation
CO4	***Plan*** the layout of different types of terminals	Cognitive & Affective	Understanding Manipulation
CO5	***Demonstrate*** the fundamentals of Intelligent Transportation Systems	Cognitive & Psychomotor	Remembering Observation

COURSE CONTENT

UNIT I	**INTRODUCTION**	**9**
	Importance of transportation, different modes of transportation, characteristics of road transport, scope of highway and traffic engineering Highway development and planning: Importance, classification of roads, road patterns, planning surveys; highway alignment and surveys Highway Geometric Design: Cross section elements, sight distance, design of horizontal and vertical alignment	
UNIT II	**TRAFFIC ENGINEERING**	**9**
	Traffic characteristics - Traffic studies-speed, volume, speed and delay, origin-destination, parking and accident studies; capacity of urban roads and highways; traffic operations-regulation and control; design of intersections- at grade and grade separated Pavement Materials and Design: Specifications and tests on pavement materials, pavement design factors, design of flexible and rigid pavements as per IRC	
UNIT III	**RAILWAY ENGINEERING**	**9**
	Location surveys and alignment - Permanent way - Gauges - Components - Functions and requirements - Geometric design Track Junctions-Points and	

crossings - types and functions - design and layout - simple problems - Railway stations and yards. Signaling and interlocking - control systems of train movements

UNIT IV	AIRPORT ENGINEERING	7

Aircraft characteristics - Airport obstructions and zoning - Runway - taxiways and aprons- Terminal area planning

UNIT V	DOCKS AND HARBOURS AND URBAN TRANSPORTATION SYSTEMS	11

Types - Layout and planning principles- breakwaters - docks- wharves and quays - Transit sheds- warehouses- navigation aids.

Bus transit - Mass Rapid Transit System - Light Rail Transit. Transport economics and Financing - Intelligent Transportation Systems (ITS)

L	T	P	Total
45	0	0	45

TEXT BOOKS

5. Khanna, S.K and Justo, C.E.G., Highway Engineering, Nem Chand and Bros. 2001
6. Kadiyali, Principles of Highway Engineering, Khanna Publishers, 2019
7. M.M. Agarwal, Railway Engineering, Prabha & Co. 2007.
8. Khanna, S.K. and Arora, M.G. Airport Planning and Design, Nemchand and Bros. 1999.

REFERENCE BOOKS

4. Kadiyali, L.R, Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi, 1999
5. Oza and Oza, Elements of Dock and Harbour Engineering, Charotar Publishing House, 1996.
6. Vazirani V N and Chandola S P “Transportation Engineering - Vol.2”, Khanna Publishers, 1998

E-REFERENCES

4. https://nptel.ac.in/courses/105/101/105101087/
5. https://nptel.ac.in/courses/105/105/105105107/
6. https://nptel.ac.in/courses/105/104/105104098/

IS Codes

2. IRC and IRC SP codes and manuals

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	1		1		1		2		1		1	2	1
CO 2	1	2	1	1		2		2		1		1	1	2
CO 3	1	2	1	1		1		2		1	1	1	2	1
CO 4	2	2	1	1	1	2		1		1	1	1	2	2
CO 5	1	3	1	1	1	1	2	2	3	1	1	1	1	1
Total	8	10	4	5	2	7	2	9	3	5	3	5	8	7

Scaled Value

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : III

Course Code : PCE 305

Course Name : CONCRETE AND HIGHWAY LAB

Prerequisite : TRANSPORTATION ENGINEERING

L	T	P	C
0	0	3	3

C	P	A
2	0.5	0.5

L	T	P	H
0	0	3	6

Course Objectives

- To understand the handling of equipments
- To provide the hands on training in determination of properties of pavement materials
- To provide the knowledge on the use of experimental results pertaining to pavement design

Course Outcome: After the completion of the course, students will be able to **Domain C or P or A** **Level**

CO1	***Identify*** and ***analyze*** various types of pavement materials	Psychomotor	Remembering & Observation
CO2	***Determine*** the necessary properties of pavement materials	Psychomotor	Analyzing Respond to Phenomena Observation
CO3	***Investigate*** the appropriate methods and equipments.	Psychomotor	Remembering Observation

COURSE CONTENT

Experiments in Transportation Engineering	**30**

Tests on Aggregates

- CBR test.
- Aggregate crushing value test.
- Los Angeles abrasion value test of aggregates.
- Aggregate impact value test.
- Shape test of aggregates - Flakiness Index
- Specific gravity and water absorption test for coarse aggregates.
- Fineness modulus

Tests on Bituminous Materials

- Softening point (Ring and ball test) of bitumen.
- Penetration value test of bitumen.
- Marshall Stability test.
- Specific gravity.
- Loss on heating
- Design of B C mix
- Binder content

L	T	P	Total
0	0	30	30

TEXT BOOKS

4. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2014.
5. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010
6. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013.

REFERENCE BOOKS

3. Highway Materials and Pavement Testing, Nem Chand and Bros., Roorkee, Revised Fifth Edition,

2009

4. Mix Design Methods Asphalt Institute Manual Series No. 2, Sixth Edition,1997, Lexington, KY, USA

E-REFERENCES

2. https://www.vlab.co.in/ba-nptel-labs-civil-engineering

IS Codes

3. Methods for testing tar and bituminous materials, IS 1201-1978 to IS 1220- 1978, Bureau of Indian Standards
4. Methods of test for aggregates, IS 2386 – 1978, Bureau of Indian Standards

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2				3			1				1	1	1
CO 2	2				3			1				1	1	1
CO 3	2				3			1	1	1		1	1	1
Total	6				9			3	1	1		3	3	3
Scaled Value														

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : IV

Course Code : PCE 402

Course Name : GEOTECHNICAL ENGINEERING – II

Prerequisite : MECHANICS OF SOLIDS AND GEOTECHNICAL ENGINEERING - I

L	T	P	C
2	1	0	3

C	P	A
2	0.5	0.5

L	T	P	H
2	1	0	3

Course Objectives

- To understand the application of soil properties in stability of slope analysis, improvement of soil

strength and effect of lateral earth pressure on geostructures.

- To estimate the load carrying capacity of different types of soils
- To satisfy the expectation of ability of calculating the dimensions of shallow foundations
- To know about the types, analysis and design of deep foundations, geo-environmental, geotechnical earthque engineering

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	***Identify*** and ***analyze*** different types slope failures.	Cognitive & Affective	Remembering & Analyzing
CO2	***Analyze*** earth retaining structures with different loading conditions and able to understand the soil stabilization methods	Cognitive Affective	Analyzing & Responding
CO3	***Determine*** the safe bearing capacity of different soils. ***Calculate*** the size and shape of foundation required for actual loading from structures.	Cognitive, Affective & Psychomotor	Applyzing & Manipulating
CO4	***Demonstrate*** the failure modes of piles, piers and caissons	Cognitive & Psychomotor	Understanding & Manipulating
CO5	***Understand*** the effect of soil pollution and soil dynamics on foundation performance	Cognitive & Affective	Remembering Analyzing

COURSE CONTENT

UNIT I	**STABILITY OF SLOPES**	**8**

Classifications of slopes, Stability analysis of infinite slopes. Stability analysis of finite slopes by Swedish and Friction circle method.

Stability analysis by Taylor's stability number, Taylor stability number

curves. Stability of slopes of earthen embankments under sudden draw down, steady seepage and during construction. Bishop's method of stability analysis.

UNIT II	**SOIL RETAINING WALLS AND GROUND IMPROVEMENT TECHNIQUES**	**8**

Active, passive and earth pressure at rest. Rankine's and Coulomb's theories of earth pressure. Rebhann's and Culman's graphical methods for active earth pressure for vertical and inclined back retaining walls, horizontal and inclined cohesion less back fill. Earth pressure on cantilever sheet piles Stability analysis of retaining walls.

Ground modification by vibro replacement, stone columns, preloading and prefabricated drains, Reinforced earth structures, Introduction to geotextiles and geomembranes, applications of geotextiles, design methods using geotextiles, geogrids, geonets, geomembranes, geotubes, grouting, deep mixing, PVDs, vacuum consolidation.

UNIT III	BEARING CAPACITY OF SOIL AND SHALLOW FOUNDATIONS	10

Methods of estimation of bearing capacity, effect of water table on bearing capacity, Terzaghi, Vesic, Hansen, Moyerhof's analysis, Bearing capacity of stratified soils. IS code recommendations for minimum depth, factor of safety, design for local shear and general shear failure. Methods of estimation of settlement of footings. Limits of settlements for various structures, Methods of finding out bearing capacity from plate load test, standard penetration test data. Collapsible soil; Identification, Collapse settlement: foundation design. Behaviour of expansive soil, foundation practices, underreamed piles. Methods of finding out load carrying capacity of under reamed piles in clayey and sandy soil. Provision of IS 2911 Part III-1980 for design of under-reamed pile foundations.

UNIT IV	DEEP FOUNDATIONS AND MACHINE FOUNDATIONS	10

Philosophy of deep foundation, piles - classification, estimation of individual and group capacity, static and dynamic approaches, pile load test, settlement of pile and pile groups, negative skin friction. piers, caissons or well foundation – analysis, tilting and corrections, Cofferdams – construction, use.

Machine foundations; introduction, machine vibration, structural design of foundation to rotary machines, impact machines, vibration characteristics, design consideration of foundation to impact machine, grillage, pile and raft foundation.

UNIT V	ENVIRONMENTAL GEOTECHNOLOGY AND EARTHQUAKE GEOTECHNOLOGY	9

A consideration of technical and scientific aspects of key geo-societal issues. Case studies and analysis of current and historic databases will be used to illustrate topics including impact of climate change, energy resources, water and soil pollution, and health risks posed by heavy metals and emerging pollutants. Sanitary land fills, settlement of sanitary land fill.

Introduction to soil dynamics, Different methods of analysis for earthquake conditions - Pseudo-static method of design - Effect of earthquake forces on various foundations, Liquefaction, Tsunami, soil behavior during earthquake – foundation settlement and land sliding during earthquake – remedial measures.

Application of Remote Sensing, GIS and GPS in contaminated soil mapping and other geotechnical study

L	T	P	Total
30	15	0	45

TEXT BOOKS

5. Murthy, V. N. S. "Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering", CRC Press, 2002
6. Purushothama Raj, P. Ground Improvement Techniques, Laxmi Publications. 2016
7. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 3rd edition, 2005, Reprint 2011.
8. Punmia. B.C.,Asok Kumar Jain and Arun Kumar Jain, "Soil Mechanics and Foundations" Laxmi Publications Pvt. Ltd., New Delhi, Sixteenth edi.tion,2005

REFERENCE BOOKS

9. Terzaghi, K., Peck, R. B. &Mesri, G., "Soil Mechanics in Engineering Practice", Wiley, 1996.
10. Craig, R.F. "Craig's Soil Mechanics", 7th Ed., Spon Press, 2004.
11. Holtz, R.D. & Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice Hall, 1981.
12. Lambe, T.W. & Whitman, R.V., "Soil Mechanics", John Wiley & Sons, 1979.
13. Mitchell, J.K. & Soga, K., "Fundamentals of Soil Behaviour", John Wiley & Sons, 2005.
14. Coduto, D.P. "Geotechnical Engineering: Principles and Practices", Pearson Education, Prentice Hall, 2007.
15. Jie Han, "Principles and Practice of Ground Improvement", John Wiley & Sons, 2020
16. Das, B.M. "Principles of Geotechnical Engineering", Thomson Books, 2013.

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4. https://nptel.ac.in
5. https://nptel.ac.in/courses/105/101/105101201/
6. http://www.nitttrchd.ac.in/sitenew1/civil/civil.php#page=page-1

IS Codes

6. IS : 2974 (Part I to V) code of practice for different types of machine foundation
7. IS : 6403 – 2016 – Code of practice for shallow foundation
8. IS : 1904 – 2002 – Code of practice for design and construction of foundation
9. IS : 2911 – 20016 – Code of practice for design and construction of pile
10. IRC – 78 – 2000 – Code of practice for road bridges and specifications

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1	1		1		1		1		1		1	1	2
CO 2	2	1	1	1		1		2		1		1	2	2
CO 3	1	1	2	1	1	1		3		2	1	1	1	2
CO 4	1	1	1	1	1	1		1		1	1	1	2	2
CO 5	2	2	1	1	1	1	1	3	3	1	1	1	2	2
Total	7	6	5	5	3	5	1	10	3	6	3	5	8	10
Scaled Value														

Note:

Total	0	1-5	6-10	11-15
Scaled	0	1	2	3

value				
Relation	No	Low	Medium	High

Semester : V

Course Code : PCE 501

Course Name : DESIGN OF STEEL STRUCTURES

Prerequisite : MECHANICS OF SOLIDS

L	T	P	C
3	1		4

C	P	A
2	1	0

L	T	P	H
3	2		5

Course Objectives

To understand the provisions of IS800-2007 code of practice for the design of structural members using various connections and cross-sections.

To study the behavior and design of compression, tension members and flexural members using simple and built-up sections.

To study the design of bolted and welded connections.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Design of structural connections	Cognitive	Understand
CO2	Design of tension	Cognitive & Affective	Analyse & Apply
CO3	Design of compression members	Cognitive	Understand
CO4	Understand fabrication of plate girders and gantry girders	Cognitive	Understand
CO5	Design of structural elements of Industrial Structures.	Cognitive	Understand

COURSE CONTENT

UNIT I	**CONNECTIONS**	**9**
	Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using welding, bolting – Design of bolted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts	
UNIT II	**TENSION MEMBERS**	**9**
	Types of sections – Net area – Net effective sections for Angles and Tee – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag	
UNIT III	**COMPRESSION MEMBERS**	**9**

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base

UNIT IV BEAMS 9

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders– Intermediate and bearing stiffeners – Web splices – Design of beam columns

UNIT V TRUSSES AND INDUSTRIAL STRUCTURES 9

Roof trusses – Roof and side coverings – Design loads - Design of purlin and elements of truss- Design of gantry girder

L	T	P	Total
45	0	0	45

TEXT BOOKS

4. N.Subramaniayan , "Design of Steel Structures: Theory and Practice" , Oxford University Press, 2010.
5. S.S Bhavikatti, "Design of Steel Structures", I.K International Publishing Houses Pvt. Ltd, 2012.
6. Ramachandra S., "Design of Steel Structures – Vol. I & II", Standard Publication, New Delhi,2010

REFERENCE BOOKS

4. Duggal S.K., "Limit state Design of Steel Structures", 2nd edition, Tata McGraw - Hill Education, 2014
5. Dayaratnam, P., "Design of Steel Structures", A.H.Wheeler& Co. Ltd., Allahabad, 2008
6. Jack C. McCormac , Stephen F.Csernak , "Structural Steel Design"Prentice Hall, Jul 2011

IS Codes

3. IS 800 -2007, General Construction in Steel, Code of Practice.
4. SP6 – 1 : ISI Hand Book of Structural Engineers, Part -I

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	1	3	2			1	1	1				2	
CO 2	2	1	3	2			1		1				2	
CO 3	1	1	3	1		1							1	
CO 4	3	1	3	3	1	1							2	
CO 5	2	1	2	1		1							2	

Total	10	5	15	9	1	3	2	1	2				9	
Scaled Value	**2**	**1**	**3**	**2**	**1**	**1**	**1**	**1**	**1**				**2**	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : V

Course Code : PCE 504

Course Name : COMPUTER AIDED DESIGN & DRAFTING

Prerequisite : COMPUTER AIDED CIVIL ENGINEERING DRAWING

L	T	P	C
0	0	1	1

C	P	A
0	3	0

L	T	P	H
0	0	2	2

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	To select the appropriate Structural system for a conventional reinforced concrete Structure	Psychomotor	Respond
CO2	Determine the preliminary designs of structures assuming preliminary dimensions	Psychomotor	Respond
CO3	Apply the fundaments of reinforced concrete to design structures like retaining walls, water tanks, staircase, and other structures of importance.	Psychomotor	Respond
CO4	Understand fabrication of plate girders and gantry girders	Psychomotor	Respond
CO5	Design of structural elements of Industrial Structures.	Psychomotor	Respond

COURSE CONTENT

Detailed design and drawing of the following reinforced concrete structures and steel structures using software packages like Auto CAD /Revit and Staad Pro / Etabs.

9. Design of Raft and Pile with pile cap (Four Piles only) Foundations and reinforcement details.
10. Design and Drawing of RCC cantilever and counterfort type retaining walls with reinforcement details.
11. Detailing and Drafting of Solid slab and RCC Tee beam bridges for IRC loading and reinforcement

details.

12. Design and Drawing of staircase.
13. Detailing and Drafting of Circular and Rectangular Water Tank .
14. Design of plate girder bridge – Detailed Drawings including connections.
15. Design of Gantry girder– Detailed Drawings including connections.
16. Design of Roof Truss – Detailed Drawings including Connections.

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2007.

2. Devadas Menon & Unnikrishnan Pillai, Reinforced Concrete Design, Tata McGraw-Hill Publishing Company Ltd., New Delhi 2011

3. Ramachandra S., "Design of Steel Structures – Vol. I & II", Standard Publication, New Delhi,2010

REFERENCE BOOKS

1. Dr.P.Purushothaman, Reinforced Concrete Structures, Oxford Publication (P) Ltd, Delhi, 2007.

2. Krishnamurthy, D., "Structural Design & Drawing – Vol. II", CBS Publishers & Distributors.

3. Duggal S.K.,"Limit state Design of Steel Structures", 2nd edition, Tata McGraw Hill, 2014.

IS CODES:

1. IS 456 -2000, Plain and Reinforced Concrete – Code of Practice, 4th revision

2.SP16-1980, SP6 – 1 : ISI Hand Book of Structural Engineers, Part -I

3. IS 800 -2007, General Construction in Steel, Code of Practice.

Mapping of CO with PO's

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

CO4	1	1	3	1		1							1	
CO5	3	1	3	3	1	1							2	
Total	**10**	**6**	**10**	**6**	**1**	**4**	**2**	**1**	**1**		**1**		**9**	**1**
Scaled Value	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**		**1**		**2**	**1**

1 – Low, 2 – Medium, 3 – High

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : VI

Course Code : PCE 601

Course Name : FINITE ELEMENT METHOD

Prerequisite : STRUCTURAL ANALYSIS

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Gain knowledge on basic concepts of FEM	Cognitive	Understand
CO2	Determine stresses and displacements for one and two dimensional elements under various loading.	Cognitive	Understand
CO3	Analyse the higher order elements using Isoparametric mapping and numerical integration.	Cognitive	Analyse
CO4	Identify and Apply concepts of FEM in fluid mechanics.	Cognitive	Apply

COURSE CONTENT

UNIT I INTRODUCTION – VARIATIONAL FORMULATION 9

Methods of Engineering analysis – Basic concept of FEM and its procedure- Advantages and Disadvantages - Weighted Residual Method – Principle of Stationary Total Potential – Rayleigh Ritz method.

UNIT II	ONE DIMENSIONAL FINITE ELEMENT ANALYSIS	9

Finite element: modelling, coordinates, shape functions, stiffness matrix, stiffness equation, finite element equation for onedimensional element. Load or force vector – Temperature effects.

UNIT III	TWO DIMENSIONAL FINITE ELEMENT ANALYSIS	9

Finite element modelling, coordinates, shape functions, stiffness matrix, stiffness equation, finite element equation for two dimensional elements. Plane stress and plane strain – Constant Strain Triangular element – Linear Strain Triangular elements - Temperature effects.

UNIT IV	ISOPARAMETRIC ELEMENTS AND FORMULATION	9

Shape function for 4 noded elements using natural coordinate system and transformation – element stiffness matrix equations –Higher order two dimensional element – Shape function derivation for rectangular and triangular element – Lagrangean and Serendipity elements.

UNIT V	APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSION	9

Heat Transfer – Application to Heat Transfer in two dimensions – Application to Fluid Mechanics in two dimensions.

L	T	P	T
45	0	0	45

TEXT BOOKS

4. **Krishnamoorthy,C.S.,"Finite Element Analysis –Theory and Programming", Second Edition,TataMcGraw Hill, 2015.**
5. **Bhavikati , S.S., "Finite Element Analysis ", New Age International Publishjers , 2016.**
6. **S.S.Rao, "The Finite Element Method in Engineering", Pergaman Press, 2011.**

REFERENCES

5. **J.N.Reddy, "An Introduction to Finite Element Method", McGraw-Hill, Intl.Student**
6. **Edition, 2013.**
7. **Chandrupatla, T.R., and Belegundu, A.D., "Introduction to Finite Element in Engineering", Third Edition, Prentice Hall, India, 2012.**
8. O. C. Zienkiewicz, Robert Leroy Taylor, PerumalNithiarasu, "The Finite Element Method for Fluid Dynamics", Butterworth-Heinemann, 2013.

Mapping of CO's with PO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	1	3	2			1							1	1
CO2	2	2	3	1		1							1	
CO3	3	1	1	1		2				2		1	1	1
CO4	3	2	1		1	1	1	1	1	1	1			
Total	9	8	7	2	1	5	1	1	1	3	1	1	3	2
Scaled Value	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester :

Course Code : PCEE01

Course Name : Smart Structures and Materials

Prerequisite : ----

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Study about the smart materials and its characteristics	Cognitive	Understand
CO2	Evaluate the measurement techniques for strain	Cognitive	Understand
CO3	Design of sensors using smart materials	Cognitive	Understand
CO4	Design of actuators using smart materials	Cognitive	Understand
CO5	Energy harvesting using piezoelectric materials	Cognitive	Understand

COURSE CONTENT

UNIT I INTRODUCTION 9

Introduction to Smart Materials and Structures – Instrumented structures functions and response –Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT II MEASURING TECHNIQUES 9

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT III SENSORS 9

Sensing Technology – Types of Sensors – Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT IV ACTUATORS 9

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magneto structure Material – Shape Memory Alloys – Electro orheological Fluids– Electro magnetic actuation – Role of actuators and Actuator Materials.

UNIT V ADVANCES IN SMART STRUCTURES & MATERIALS 9

Self-Sensing Piezoelectric Transducers, Energy Harvesting Materials, Autophagous Materials, Self-Healing Polymers, Intelligent System Design, Emergent System Design

L	T	P	Total
45	0	0	45

TEXT BOOKS

5. Brain Culshaw – Smart Structure and Materials Artech House – Borton. London.
6. Smart Materials and Structures/ M. V. Gandhi and B.So Thompson/ Chapman & Hall, London; New York.
7. Gauenzi, P., Smart Structures, Wiley, 2009
8. Michelle Addington and Daniel L. Schodek, “Smart Materials and Technologies: For the Architecture and Design Professions”, Routledge 2004.

REFERENCE BOOKS

4. Electro ceramics: Materials, Properties/ A.J. Moulson and J.M-Herbert/ Wiley/ 2nd Edition, (ISBN: 0471497479).
5. Piezoelectric Sensories: Force, Strain, Pressure, Acceleration and Acoustic Emission Sensors. Materials and Amplifiers/ G. Gautschi/ Springer, Berlin; New York,2002 (ISBN:3540422595)
6. L. S. Srinath, “Experimental Stress Analysis”, Tata McGraw-Hill, 1998

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3		1	3						2		2	
CO 2	1	3				2					2		2	
CO 3	1	2	2	1			1	1			2		1	
CO 4	1	2	2	1			1	1			2		1	
CO 5	1	2												
Total	6	12	4	3	3	2	2	2			8		6	
Scaled Value	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**1**			**2**		**2**	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester :

Course Code : PCEOE2

Course Name : GIS for Civil Engineering

Prerequisite : Nil

L	T	P	C
3	0	0	3

C	P	A
1.5	1.0	0.5

L	T	P	H
3	0	0	3

Course Objectives

- To understand the basic concepts of remote sensing
- To know the applications of Geographic information systems in Civil Engineering
- To identify the basic remote sensing concepts and its characteristics
- To implement the photogrammetry concepts and fundamentals of Air photo interpretation
- To use various analysis and interpretation of GIS results

Course Outcome: After the completion of the course, students will be able to	**Domain C or P or A**	**Level**

CO1	***Explain*** about the fundamentals of remote sensing	Cognitive Affective	Remembering Respond & Observation
CO2	***Facilitating*** complex querying and analysis	Cognitive Affective	Analyzing Observation
CO3	***Maximizing*** the efficiency of planning and decision making	Cognitive, Affective Psychomotor	Application Respond to Phenomena Manipulation
CO4	***Integrating*** information from multiple sources	Cognitive Affective Psychomotor	Understanding Manipulation Apply
CO5	***Eliminating*** redundant data and minimizing duplication and apply in civil engineering field	Cognitive Psychomotor	Remembering Observation

COURSE CONTENT

UNIT I	**INTRODUCTION TO REMOTE SENSING**	**11**
	Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory - Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts - Types of platforms and sensors - Passive and Active sensors – resolution concept - Image interpretation – Image processing	
UNIT II	**INTRODUCTION TO GIS AND MAPS**	**9**
	History of GIS, Early Developments in GIS, Applications of GIS, Components of a GIS - Introduction – Maps and Globe – Types of map – Map scale - standard GIS software	
UNIT III	**GEOREFERENCING AND MAP PROJECTION**	**6**
	Understanding Earth – Georeferencing – Transformation – Coordinate System - Map projections – types of map projections – map analysis	
UNIT IV	**GIS – DATA ENTRY, STORAGE AND ANALYSIS**	**10**
	Spatial Database Management System – Data storage - Data Structure models – Vector and raster data – data compression – data input by digitization and scanning, data storage – attribute data analysis – integrated data analysis – Data interpolation - mapping concept - development of map overlay, overlay operation – Errors and quality control.	
UNIT V	**APPLICTIONS OF GIS IN CIVIL ENGINEERING**	**9**
	Web GIS - Modeling in GIS Highway alignment studies – Land Information System - Terrain Mapping and Analysis - Watershed Analysis - Environmental Engineering & Impact Studies - Wastewater and Stormwater Management - Disaster Management - Structural Engineering – Soil Mapping	

L	T	P	Total
45	0	0	45

TEXT BOOKS

4. Shahab Fazal, , (2015), G I S Basics, New Age International Publications, Chennai
5. Burrough P.A. (2000), Principle of Geographical Information Systems for land resources assessment, Clarendon Press, Oxford.
6. Anji Reddy.M. (1998), Remote Sensing and Geographical information systems.

REFERENCE BOOKS

6. Lo & Yeung (2005), Geographic Information Systems, Prentice of India.
7. Lillesand, T.M. & Kiefer R.W. (1998), Remote Sensing and image interpretation, John Wiley & Sons, Newyork.
8. Clarke Parks & Crane (2005), Geographic Information Systems & Environmental Modelling, Prentice-Hall of India.
9. Wolf Paul (1998), Elements of Photogrammetry, McGraw Hill, New Delhi.
10. Goodchild, M.F., Longley, P.A., Maguire, D. J. & Rhind, D.W 2001, *Geographic information systems and science*, John Wiley & Sons Ltd. , England.

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3. https://nptel.ac.in/courses/105/102/105102015/
4. http://webhelp.esri.com/arcgisserver/9.3/java//index.htm#wms_service.htm

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	1	1	1		1		2		1		1	2	1
CO 2	1	2	1			2		2		1		1	2	2
CO 3	3	1	1	1		1		2		1	1	1	2	1
CO 4	2	2	1	1	1	2		1		1	1	1	2	2
CO 5	1	3	1	1	1	1	2	2	3	1	1	1	1	1
Total	10	9	5	4	2	7	2	9	3	5	3	5	9	7
Scaled Value														

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester

Course Code **PCEE12**

Course Name **WATER RESOURCES ENGINEERING**

Prerequisite **NIL**

L	T	P	C
2	2	0	3

C	P	A
2.5	0	0.5

L	T	P	H
2	2	0	4

Course Objectives

- To prepare the students for a successful career as hydrologist and water resources engineers
- To develop the ability among students to synthesis data and technical concepts for application in hydrology and water resources engineering
- To provide students an opportunity to work as a part of interdisciplinary team
- To promote student awareness of the life-long learning and to introduce them professional ethics and codes of professional practice in water resource engineering

Course Outcomes:

At the end of the course, students must be in a position to:		**Domain C or P or A**
CO1	Understand the interaction among various processes in the hydrologic cycle	C
CO2	Understand the forms of precipitation and measurements.	C
CO3	Understand runoff , ground water and well hydrology	C
CO4	Understand water requirement of crops-Crops and crop seasons in India, Methods of applying water.	C
CO5	Understand application of Distribution systems- cannel, Dams, reservoir and spillway.	C

UNIT I **INTRODUCTION** **9**

Hydrologic cycle, water-budget equation, history of hydrology, world water balance, applications in engineering, sources of data. *Precipitation* - forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth area- duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India

UNIT II	ABSTRACTIONS FROM PRECIPITATION	9

Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration.

UNIT III	RUNOFF	9

Runoff volume, SCS-CN method of estimating runoff volume, flow duration curve, flow-mass curve, hydrograph, factors affecting runoff, hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph surface water resources of India, environmental flows.*Ground water and well hydrology* - forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests

UNIT IV	WATER WITHDRAWALS AND USES	9

Water for energy production, water for agriculture, water for hydroelectric generation; flood control. Analysis of surface water supply, Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

UNIT IV	DISTRIBUTION SYSTEMS	9

Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. *Dams and spillways* - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

L	T	P	Total
45	0	0	45

TEXT BOOKS:

4. Subramanya. K," Engineering Hydrology", Tata Mc-Graw Hill publishing pvt. Ltd., New Delhi, 2010.
5. K N Muthreja, "Applied Hydrology", Tata Mc-Graw Hill publishing pvt. Newdelhi
6. Larry W. Mays "Water Resources Engineering", Wiley; 2 edition (June 8, 2010)

REFERENCE BOOKS

4. G.L. Asawa "Elementary Irrigation Engineering" New Age International Publisher (1999).
5. G. L. Asawa, "Irrigation Engineering ", John Wiley & Sons Australia, Limited, 1994.
6. J D Zimmerman "Advances in Irrigation" Elsevier, 2013.

Mapping of CO's with PO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	0	3	0	1	1	0	0	0	0	0	0	0	0
CO 2	3	1	3	0	1	1	0	0	0	0	0	0	0	0
CO 3	2	1	3	0	1	1	0	0	0	0	0	0	0	0
CO 4	2	1	3	0	1	1	0	0	0	0	0	0	0	0
CO 5	2	0	3	0	1	1	0	0	0	0	0	0	0	0
Total	11	3	15	0	5	5	0	0	0	0	0	0	0	0
Scaled Value	3	1	3	0	1	1	0	0	0	0	0	0	0	0

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester

Course Code **PCEE22**

Course Name **TALL STRUCTURES**

Prerequisite **Design of Concrete Structures, Design of Steel Structure**

L	T	P	C
3	1	0	3

C	P	A
2	0	1

L	T	P	H
3	0	0	3

Preamble

This course provides the basic knowledge of the design principles and the material properties of tall buildings. The study includes the various structural behaviour of different types of frames. It also deals with the analysis and design parameters of tall structures.

Course Objective:

5. To know the design criteria based on different loading conditions.
6. To gain knowledge about the structural behavoiur of various frames.
7. To learn about the different methods of analysis of tall structures.
8. To make the students understand about the stability factors of tall buildings.

Course Outcome:		**Domain**
On the successful completion of the course, students will be able to		
CO1	Identify the design criteria and design philosophy.	C(Understand)
CO2	Approach the design of tall buildings with static and dynamic loading.	C(Application)
CO3	Assimilate the behaviour of different types of structural systems.	C (Understand)
CO4	Analyse the members and identify the reduction techniques	C(Analyse)
CO5	Correlate the translational and torsional effects in tall buildings	C(Evaluate)

COURSE CONTENT

UNIT - I	**DESIGN CRITERIA**	**9**
	Design philosophy - Loading - sequential loading - strength and stability - stiffness and drift limitations - human comfort criteria, creep – shrinkage and temperature effects – fire – foundation, settlement and soil structures interaction.	
UNIT - II	**LOADS ON TALL BUILDINGS – CODE RECOMMENDATIONS**	**9**
	Gravity loadings: Dead load & live load – Live load reduction methods – impact load – gravity load –construction load. Wind Loading : Static & dynamic approach – Analytical & wind tunnel experimental method Earthquake Loading : Equivalent lateral force – model analysis –combination of loading	
UNIT-III	**BEHAVIOUR OF STRUCTURAL SYSTEMS**	**9**
	Rigid frames – braced frames – In filled frames – shear walls –coupled shear walls – wall frames tubular – cores & hybrid mega systems.	
UNIT -IV	**ANALYSIS AND DESIGN**	**9**
	Modeling for approximate analysis - Accurate analysis and reduction Techniques - Analysis of buildings as total structural system considering overall integrity and major subsystem interaction - Analysis for member forces - drift and twist - computerized general 3D analysis.	
UNIT - V	**STABILITY OF TALL BUILDING**	**9**

Overall buckling analysis of frames - wall - frames - Approximate methods - second - order effects of gravity loading - p - Delta analysis Simultaneous first order and P-Delta analysis, Translational - Torsional instability out of plumb effects - stiffness of member instability - effect of foundation rotation.

L	T	P	Total
45	0	0	45

TEXT BOOKS

4. Dave parker, Antony wood , "The Tall Buildings-Reference Book", Routledge - Taylor & Francis group, London, 2013
5. Guy Nordenson, Terence riley, "Tall buildings", The museum of modern art, New York, 2003.
6. Bryan Stafford Smith, Alexcoull, Tall Building Structure Analysis and Design, John Wiley & Sons, 1991.

REFERENCES

1. Wolf Gang Schuller, "High Rise Building Structures", John Wiley &sons, 1977.

2.Taranath.B.S , "Structural Analysis & Design of Tall Buildings", Tata McGraw Hill, 1988.

3. Lynn, S.Beedle, "Advances in Tall Buildings", CBS Publishers, Delhi, 1986.

Mapping of CO's with PO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1	2	1	0	1	1	1	1	**0**	2	1	1	2	4
CO 2	1	0	2	1	1	1	1	1	**0**	1	0	2	1	3
CO 3	2	2	3	1	1	2	**0**	1	1	0	0	0	2	1
CO 4	1	0	2	1	0	1	1	0	0	1	1	1	1	2
CO 5	1	2	3	1	0	2	0	1	0	1	0	2	1	2
Total	6	6	11	4	3	7	3	4	1	5	2	6	7	12
Scaled Value	2	2	3	1	1	2	1	1	1	1	1	2	2	3

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	
Course Code	**PCEE26**
Course Name	**PRESTRESSED AND PRE FABRICATED STRUCTURES**
Prerequisite	**DESIGN OF CONCRETE STRUCTURES**

L	T	P	H
3	0	0	3

C	P	A
2	0.5	0.5

L	T	P	H
3	0	0	3

Course Objectives

- To introduce the concept of prestressing, methods and advantages.
- Todesign the prestressed concrete structures subjected to flexure, shear, tension and compression.
- To acquire knowledge about the concept of circular prestressing and its application.

Course Outcome:		**Domain C or P or A**
CO1	Understand the need of the prestressed concrete and the methods of prestressing.	C
CO2	Identify and apply the design codes relevant for the designof prestressed concrete members	C & P
CO3	Accomplish the design calculation to predict circular prestressing behaviour of prestressed concrete structures.	A
CO4	Understand the behaviour of composite section and analyse the stress under different conditions.	C
CO5	Analyse the behaviour of statically indeterminate structures for the primary and secondary moments.	C

COURSE CONTENT

UNIT I	**INTRODUCTION – THEORY AND BEHAVIOUR**	**9**
	Basic concepts – Advantages – Materials required – Systems and methods of prestressing –Analysis of sections by Stress concept, Strength concept and Load balancing concept - Effect of tendon profile on deflections – Factors influencing deflections – Calculation of short term and long term deflections –Losses of prestress.	
UNIT II	**DESIGN OF MEMBERS.**	**9**
	Behaviour of flexural members, determination of ultimate flexural strength – Various Codal provisions - Design for shear, bond and torsion, Design of Tension member, Design of Compression member. Stress distribution in end block-Design of anchorage zone reinforcement.	
UNIT III	**CIRCULAR PRESTRESSING**	**9**
	Prestressed Concrete Pipes- Advantages, Loads - Design of cylinder and non-cylinder pipes. Prestressed Concrete Tanks-Choice of types of tanks.	

UNIT IV	COMPOSITE CONSTRUCTION	9

Types of composite Construction - Analysis of stresses – Differential Shrinkage - Estimation of Deflection. Partial prestressing - its advantages and applications.

UNIT V	CONTINUOUS BEAMS	9

Analysis of continuous beams - Methods of achieving continuity - concept of linear transformations, concordant cable profile and cap cables.

L	T	P	Total
45			45

TEXT BOOKS

4. Krishna Raju. N, Prestressed Concrete, Tata McGraw Hill Publishing Co. Ltd, New Dehi, 2012
5. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.
6. Libby J.R., Modern Prestressed Concrete, 3e,CBS Publishers & Distributors, New Delhi, 2007

REFERENCES

4. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
5. Ramaswamy G.S., Modern prestressed concrete design, Arnold Heinimen, New Delhi.
6. David A.Sheppard, William R. and Philips, Plant Cast precast and prestressed concrete – A design guide, McGraw Hill, New Delhi,2012.

IS Codes

4. IS1343:2012, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012
5. IS 3370-3 (1967): Code of Practice Concrete structures for the storage of liquids, Part 3: Prestressed concrete structures, Bureau of Indian Standards, New Delhi, 2008
6. IS 3370-4 (1967): Code of practice for concrete structures for the storage of liquids, Part 4: Design tables, Bureau of Indian Standards, New Delhi, 2008

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1		1	1	1	1		2	1	1	2	4
CO2	1		2	1	1	1	1	1		1		2	1	3
CO3	2	2	3	1	1	2		1	1				2	1
CO4	1		2	1		1	1			1	1	1	1	2
CO5	1	2	3	1		2		1		1		2	1	2
Total	6	6	11	4	3	7	3	4	1	5	2	6	7	12

Scaled Values	2	2	3	1	1	2	1	1	1	1	1	2	2	3

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High