NEHRU INSTITUTE OF TECHNOLOGY

AN AUTONOMOUS INSTITUTION

COIMBATORE | TAMILNADU

Regulation 2023 Curriculum

B.E (CIVIL ENGINEERING)

(Applicable for students admitted in 2023)

Vision and Mission of the Institution

Vision

- To be leading Institution in Academic excellence, Multidisciplinary Research, Innovation, Entrepreneurship and Industry relation in order to mould true citizens of the country

Mission

- To create innovative and vibrant young leaders in Engineering and Technology field for building India as a knowledge power by improving the teaching-learning process
- To enhance employability, entrepreneurship and to improve the research competence to address Societal needs.
- To generate engineering graduates who use knowledge as a powerful tool to drive societal transformation and inculcate in them ethical and moral values.

DEPARTMENT OF CIVIL ENGINEERING

Vision

- To be a centre of learning in civil engineering education offering programs oriented with industry friendly curriculum meeting global standards to build ethical civil engineers embedded with research, entrepreneurship and excellence in academics to cater the needs of society.

Mission

- To establish a domain of valuable civil engineers with a pattern of discipline for the development of nation with ethical, environmental and economical concern.
- To produce civil engineers who will be able to induce knowledge-based transformation of the society.
- To attain knowledge-based society by imparting broad set of technical skills and attitude to meet the national standards.
- To provide technology based civil engineering services to meet the aspiration of the people and the industry.

Program Educational Objectives (PEOs)

The Civil Engineering graduate can

PEO 1: Gain knowledge and skills in Civil Engineering which will enable them to have a career and professional accomplishment in the public or private sector organizations.

PEO 2: Become Consultants, Entrepreneurs, develop processes and technologies to meet desired infrastructure needs of society and formulate solutions that are technically sound, economically feasible and socially acceptable.

PEO 3: Graduates will initiate an active programme for life long professional achievement and expertise through continuous development.

Program Outcomes

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5:Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one ‘s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs)

PSO 1: Knowledge of Civil Engineering discipline

Demonstrate in-depth knowledge of Civil Engineering problems, apply independent judgment for synthesizing information and make innovative advances in a theoretical, practical and policy context.

PSO 2: Critical analysis of Civil Engineering problems and innovation

Critically analyse complex Civil Engineering problems, apply independent judgment for synthesizing information and make innovation advances in a theoretical, practical and policy context.

PSO 3: Conceptualization and evaluation of engineering solutions to Civil Engineering

Issues Conceptualize and solve Civil Engineering problems. Evaluate potential solutions and arrive at technically feasible, economically viable and environmentally sound solutions with due consideration of health, safety, and socio-cultural factors.

PEO / PO Mapping

PEOs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
II	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
III	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Mapping of Course Outcome and Programme Outcome

Year	Sem	Course Name	POs												PSOs		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I YEAR	I SEMEST	English For Engineers															
		Calculus And Differential Equations															
		Engineering Physics															

		Engineering Chemistry															
		Engineering Graphics															
		Heritage Of Tamils															
		Career Enhancement Training I															
		Basic Science Laboratory															
		Communication Laboratory															
		Engineering Practices Laboratory															
		Vocational Enhancement Training – I*															
	II SEMESTER	Design of Experiment and Numerical Methods															
		Physics of Materials															
		Engineering Mechanics															
		Tamils &Technology															
		Proficiency in English															
		C Programming															
		Computer Aided Building Drawing Lab															
		Career Enhancement Training-II															
		Vocational Enhancement Training-II*															
II YEAR	III SEMESTER	Fourier Analysis and Partial Differential Equations															
		Strength of Materials- I															
		Fluid Mechanics															
		Surveying –I															
		Engineering Geology															
		Construction Materials and Technology															
		Surveying Laboratory															
		Material Testing Laboratory															
		Employability Skills I															
		Vocational Enhancement Training-III*															
II YEAR	IV SEMESTER	Strength of Materials II															
		Applied Hydraulics Engineering															
		Surveying II															
		Soil Mechanics															
		Concrete Technology															
		EnvironmentalEcosystem and Sustainability															
		Mandatory Course I[&]															

		Hydraulics Engineering Laboratory															
		Soil Mechanics Laboratory															
		Concrete Testing Laboratory															
		Employability Skills II															
		Vocational Enhancement Training IV*															
III YEAR	V SEMESTER	Design of Reinforced Concrete Elements															
		Structural Analysis I															
		Foundation Engineering															
		Construction Project Management															
		Professional Elective I															
		Professional Elective II															
		Structural Design and Drawing Laboratory															
		Survey Camp (1 week)															
		Employability Skills III															
		Vocational Enhancement Training V*															
	VI SEMESTER	Design of Steel Structures															
		Structural Analysis II															
		Professional Elective III															
		Professional Elective IV															
		Open Elective I*															
		Open Elective II*															
		Mandatory Course II[&]															
		Design Project															
		Design Studio – 3D Modelling															
		Employability Skills IV															
		Vocational Enhancement Training VI*															

IV YEAR	VII SEMESTER	Estimation and Quantity Surveying															
		Construction Equipment & Machinery															
		Professional Elective V															
		Professional Elective VI															
		Open Elective III*															
		Open Elective IV*															

		Project Work : Phase I															
		Internship Training (4 Weeks During VI Semester - Summer)															
	VIII SEMESTER	Project Work : Phase II															

1 – Low; 2 – Medium; 3 – High; ‘- “– No correlation

SEMESTER-I								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	U23IP101	Induction Program	MC	-	-	-	-	0
THEORY								
1	U23EN101	English for Engineers	HSMC	3	0	0	3	3
2	U23MA101	Calculus And Differential Equations	BSC	3	1	0	4	4
3	U23PH101	Engineering Physics	BSC	3	0	0	3	3
4	U23CY101	Engineering Chemistry	BSC	3	0	0	3	3
5	U23GE101	Engineering Graphics	ESC	2	0	3	5	4
6	U23HS101	Heritage of Tamil	HSMC	1	0	0	1	1
7	U23EE101	Career Enhancement Training–I	EEC	1	0	2	3	1
PRACTICAL								
8	U23BS111	Basic Science Laboratory	BSC	0	0	4	4	2
9	U23EN111	Communicative English Laboratory	HSMC	0	0	2	2	1
10	U23GE111	Engineering Practices Laboratory	ESC	0	0	4	4	2
11	U23VEC02	Vocational Enhancement Training-I*	VEC	0	0	2	2	1*
Total				**16**	**1**	**17**	**34**	**24**

***Vocational enhancement training is compulsory for all students. The credit earned will be recorded in the grade sheet and included in academic criteria for continuation and not considered for SGPA / CGPA calculation. Student shall select one of the courses from the list given under VEC.**

SEMESTER-II								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	U23MA203	Design of Experiments and Numerical Methods	BSC	3	1	0	4	4
2	U23PH204	Physics of Materials	BSC	3	0	0	3	3
3	U23CE201	Engineering Mechanics	ESC	3	2	0	5	3
4	U23HS202	Tamils &Technology	HSMC	1	0	0	1	1
THEORY WITH LAB COMPONENT								
5	U23EN202	Proficiency in English	HSMC	2	0	2	4	3
6	U23CS203	C Programming	ESC	2	0	2	4	3
PRACTICAL								
7	U23CE211	Computer Aided Building Drawing Lab	PCC	0	0	4	4	2
8	U23EE202	Career Enhancement Training-II	EEC	3	0	0	3	1
9	U23VEXXX	Vocational Enhancement Training-II*	VEC	0	0	2	2	1*
Total				**22**	**2**	**6**	**30**	**20**

***Vocational enhancement training is compulsory for all students. The credit earned will be recorded in the grade sheet and included in academic criteria for continuation and not considered for SGPA / CGPA calculation. Student shall select one of the courses from the list given under VEC.**

SEMESTER-III								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	U23MA304	Fourier Analysis and Partial Differential Equations	BSC	3	1	0	4	4
2	U23CE301	Strength of Materials I	PCC	3	0	0	3	3
3	U23CE302	Fluid Mechanics	ESC	3	0	0	3	3
4	U23CE303	Surveying I	PCC	3	0	0	3	3
5	U23CE304	Engineering Geology	PCC	3	0	0	3	3
6	U23CE305	Construction Materials and Technology	PCC	3	0	0	3	3
PRACTICAL								
7	U23CE311	Surveying Laboratory	PCC	0	0	4	4	2
8	U23CE312	Material Testing Laboratory	PCC	0	0	4	4	2
9	U23EE313	Employability Skills I	EEC	3	0	0	3	1
10	U23VEXXX	Vocational Enhancement Training-III*	VEC	0	0	2	2	1*
Total				**21**	**1**	**10**	**32**	**24**

***Vocational enhancement training is compulsory for all students. The credit earned will be recorded in the grade sheet and included in academic criteria for continuation and not considered for SGPA / CGPA calculation. Student shall select one of the courses from the list given under VEC.**

SEMESTER-IV								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	U23CE401	Strength of Materials II	PCC	3	0	0	3	3
2	U23CE402	Applied Hydraulics Engineering	PCC	3	0	0	3	3
3	U23CE403	Surveying II	PCC	3	0	0	3	3
4	U23CE404	Soil Mechanics	PCC	3	0	0	3	3
5	U23CE405	Concrete Technology	PCC	3	0	0	3	3
6	U23CY402	Environmental Ecosystem and Sustainability	BSC	2	0	0	2	2
PRACTICAL								
7	U23CE411	Hydraulics Engineering Laboratory	PCC	0	0	4	4	2
8	U23CE412	Soil Mechanics Laboratory	PCC	0	0	4	4	2
9	U23CE413	Concrete Testing Laboratory	PCC	0	0	4	4	2
10	U23EE414	Employability Skills II	EEC	3	0	0	3	1
11	U23VEXXX	Vocational Enhancement Training IV*	VEC	0	0	2	2	1*
MANDATORY COURSE								
12	U23MCXXX	Mandatory Course I[&]	MC	2	0	0	2	0[&]
Total				**22**	**0**	**14**	**36**	**24**

***Vocational enhancement training is compulsory for all students. The credit earned will be recorded in the grade sheet and included in academic criteria for continuation and not considered for SGPA / CGPA calculation. Student shall select one of the courses from the list given under VEC.**
[&]Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under MC-I)

SEMESTER-V								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	U23CE501	Design of Reinforced Concrete Elements	PCC	3	0	0	3	3
2	U23CE502	Structural Analysis I	PCC	3	0	0	3	3
3	U23CE503	Foundation Engineering	PCC	3	0	0	3	3
4	U23CE504	Construction Project Management	HSMC	3	0	0	3	3
5	U23CEPXX	Professional Elective I	PEC	3	0	0	3	3
6	U23CEPXX	Professional Elective II	PEC	3	0	0	3	3
PRACTICAL								
7	U23CE511	Structural Design and Drawing Laboratory	PCC	0	0	4	4	2
8	U23CE512	Survey Camp (1 week)	PCC	0	0	0	0	1
9	U23EE513	Employability Skills III	EEC	3	0	0	3	1
10	U23VECx5	Vocational Enhancement Training V*	VEC	0	0	2	2	1*
Total				**21**	**0**	**6**	**27**	**22**

***Vocational enhancement training is compulsory for all students. The credit earned will be recorded in the grade sheet and included in academic criteria for continuation and not considered for SGPA / CGPA calculation. Student shall select one of the courses from the list given under VEC.**

SEMESTER-VI								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	U23CE601	Design of Steel Structures	PCC	3	0	0	3	3
2	U23CE602	Structural Analysis II	PCC	3	0	0	3	3
3	U23CEPXX	Professional Elective III	PEC	3	0	0	3	3
4	U23CEPXX	Professional Elective IV	PEC	3	0	0	3	3
5	U23CEOXX	Open Elective I*	OEC	3	0	0	3	3
6	U23CEOXX	Open Elective II*	OEC	3	0	0	3	3
PRACTICAL								
7	U23CE611	Design Project	PCC	0	0	4	4	2
8	U23CE612	Design Studio – 3D Modelling	PCC	0	0	4	4	2
9	U23EE613	Employability Skills IV	EEC	3	0	0	3	1
10	U23VECx6	Vocational Enhancement Training VI*	VEC	0	0	2	2	1*
MANDATORY COURSE								
11	U23MCXXX	Mandatory Course II[&]	MX	2	0	0	2	0
Total				**23**	**0**	**10**	**33**	**23**

[&]Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under MC-II)
***Open Elective – I& II shall be chosen from the emerging technologies**
***Vocational enhancement training is compulsory for all students. The credit earned will be recorded in the grade sheet and included in academic criteria for continuation and not considered for SGPA / CGPA calculation. Student shall select one of the courses from the list given under VEC.**

SEMESTER-VII								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	U23CE701	Estimation and Quantity Surveying	PCC	3	0	0	3	3
2	U23CE702	Construction Equipment &Machinery	PCC	3	0	0	3	3
3	U23CEPXX	Professional Elective V	PEC	3	0	0	3	3
4	U23CEPXX	Professional Elective VI	PEC	3	0	0	3	3
5	U23CEOXX	Open Elective III*	OEC	3	0	0	3	3
6	U23CEOXX	Open Elective IV*	OEC	3	0	0	3	3
PRACTICAL								
7	U23CE711	Project Work : Phase 1	EEC	0	0	4	4	2
8	U23CEI01	Internship Training (4 Weeks During VI Semester - Summer)	EEC	0	0	0	0	1
Total				**18**	**0**	**4**	**22**	**21**

***Open Elective – III & IV shall be chosen from the emerging technologies**

SEMESTER-VIII								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICAL								
1	U23CE811	Project Work : Phase II	EEC	0	0	16	16	8
Total				**0**	**0**	**16**	**16**	**8**

MANDATORY COURSES I[&]

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS
				L	T	P	
1.	U23MCxxx	Introduction to Women and Gender Studies	MC	3	0	0	0
2.	U23MCxxx	Elements of Literature	MC	3	0	0	0
3.	U23MCxxx	Film Appreciation	MC	3	0	0	0
4.	U23MCxxx	Disaster Risk Reduction and Management	MC	3	0	0	0
5.	U23MCxxx	Universal Human Values	MC	3	0	0	0
6.	U23MCxxx	Intellectual Property Rights	MC	3	0	0	0

[&]Mandatory Course are offered as a Non-credit Course (Student shall select one course from the list given above MC-I)

MANDATORY COURSES II[&]

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS
				L	T	P	
1.	U23MCxxx	History of Science and Technology in India	MC	3	0	0	0
2.	U23MCxxx	Political and Economic thought for a humane society	MC	3	0	0	0
3.	U23MCxxx	State, Nation Building and Politics in India	MC	3	0	0	0
4.	U23MCxxx	Industrial Safety	MC	3	0	0	0
5.	U23MXxxx	Entrepreneurship Development	MC	3	0	0	0
6.	U23MCxxx	Design Thinking	MC	3	0	0	0

[&]Mandatory Course are offered as a Non-credit Course (Student shall select one course from the list given above MC-II)

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I STRUCTURAL ENGINEERING	Vertical II CONSTRUCTION MANAGEMENT	Vertical III GEOTECHNICAL ENGINEERING	Vertical IV TRANSPORTATION ENGINEERING	Vertical V ENVIRONMENTAL & WATER RESOURCE ENGINEERING	Vertical VI DIVERSIFIED COURSES
Concrete Structures	Construction Techniques and Practices	Pile Foundation	Urban Planning and Management	Air Pollution and Management	3D printing in Civil Engineering
Repair and Rehabilitation of Structures	Construction Planning and Scheduling	Tunneling Engineering	Traffic Engineering and Management	Hydrology	Selection and Testing of Materials
Prestressed Concrete Structures	Building Services	Rock Mechanics	Transportation Engineering	Environmental Impact Assessment	GIS and Remote Sensing
Structural Design and Drawing	Advanced Construction Techniques	Geo-Environmental Engineering	Pavement Engineering	Environment, health and Safety	Energy Efficient Building
Prefabricated Structures	Digitalized Construction Lab	Earth Retaining Structures	Smart cities	Ground water Engineering	Building Information Modelling
Steel Concrete Composite Structures	Formwork Engineering	Ground Improvement Techniques	Metro Engineering	Municipal Solid Waste Management	AI in Civil Engineering
Structural Dynamics and Earthquake Engineering	Quality Control and Assurance	Soil Dynamics and Machine Foundations	Airports and Harbour Engineering	Environmental Engineering	Structural Health Monitoring

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1: STRUCTURAL ENGINEERING

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	U23CEP11	Concrete Structures	PEC	3	0	0	3	3
2.	U23CEP12	Repair and Rehabilitation of Structures	PEC	3	0	0	3	3
3.	U23CEP13	Prestressed Concrete Structures	PEC	3	0	0	3	3
4.	U23CEP14	Structural Design and Drawing	PEC	3	0	0	3	3
5.	U23CEP15	Prefabricated Structures	PEC	3	0	0	3	3
6.	U23CEP16	Steel Concrete Composite Structures	PEC	3	0	0	3	3
7.	U23CEP17	Structural Dynamics and Earthquake Engineering	PEC	3	0	0	3	3

VERTICAL 2: CONSTRUCTION MANAGEMENT

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	U23CEP21	Construction Techniques and Practices	PEC	3	0	0	3	3
2.	U23CEP22	Construction Planning and Scheduling	PEC	3	0	0	3	3
3.	U23CEP23	Building Services	PEC	3	0	0	3	3
4.	U23CEP24	Advanced Construction Techniques	PEC	3	0	0	3	3
5.	U23CEP25	Digitalized Construction Lab	PEC	3	0	0	3	3
6.	U23CEP26	Formwork Engineering	PEC	3	0	0	3	3
7.	U23CEP27	Quality Control and Assurance	PEC	3	0	0	3	3

VERTICAL3: GEOTECHNICAL ENGINEERING

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	U23CEP31	Pile Foundation	PEC	3	0	0	3	3
2.	U23CEP32	Tunneling Engineering	PEC	3	0	0	3	3
3.	U23CEP33	Rock Mechanics	PEC	3	0	0	3	3
4.	U23CEP34	Geo-Environmental Engineering	PEC	3	0	0	3	3
5.	U23CEP35	Earth Retaining Structures	PEC	3	0	0	3	3
6.	U23CEP36	Ground Improvement Techniques	PEC	3	0	0	3	3
7.	U23CEP37	Soil Dynamics and Machine Foundations	PEC	3	0	0	3	3

VERTICAL 4: TRANSPORTATION ENGINEERING

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	U23CEP41	Urban Planning and Management	PEC	3	0	0	3	3
2.	U23CEP42	Traffic Engineering and Management	PEC	3	0	0	3	3
3.	U23CEP43	Transportation Engineering	PEC	3	0	0	3	3
4.	U23CEP44	Pavement Engineering	PEC	3	0	0	3	3
5.	U23CEP45	Smart cities	PEC	3	0	0	3	3
6.	U23CEP46	Metro Engineering	PEC	3	0	0	3	3
7.	U23CEP47	Airports and Harbour Engineering	PEC	3	0	0	3	3

VERTICAL 5: ENVIRONMENTAL& WATER RESOURCE ENGINEERING

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	U23CEP51	Air Pollution and Management	PEC	3	0	0	3	3
2.	U23CEP52	Hydrology	PEC	3	0	0	3	3
3.	U23CEP53	Environmental Impact Assessment	PEC	3	0	0	3	3
4.	U23CEP54	Environment, health and Safety	PEC	3	0	0	3	3
5.	U23CEP55	Ground water Engineering	PEC	3	0	0	3	3
6.	U23CEP56	Municipal Solid Waste Management	PEC	3	0	0	3	3
7.	U23CEP57	Environmental Engineering	PEC	3	0	0	3	3

VERTICAL 6: DIVERSIFIED COURSES

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	U23CEP61	3D printing in Civil Engineering	PEC	3	0	0	3	3
2.	U23CEP62	Selection and Testing of Materials	PEC	3	0	0	3	3
3.	U23CEP63	GIS and Remote Sensing	PEC	3	0	0	3	3
4.	U23CEP64	Energy Efficient Building	PEC	3	0	0	3	3
5.	U23CEP65	Building Information Modelling	PEC	3	0	0	3	3
6.	U23CEP66	AI in Civil Engineering	PEC	3	0	0	3	3
7.	U23CEP67	Structural Health Monitoring	PEC	3	0	0	3	3

OPEN ELECTIVES

SL.No	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	U23CEO11	Green Buildings	OEC	3	0	0	3	3
2	U23CEO12	Nano Technology	OEC	3	0	0	3	3
3	U23CEO13	Fire Safety Engineering	OEC	3	0	0	3	3
4	U23CEO14	Project report Writing	OEC	3	0	0	3	3
5	U23CEO15	Transport and Environment	OEC	3	0	0	3	3
6	U23CEO16	Drinking Water Supply and Treatment	OEC	3	0	0	3	3

SCHEME OF CREDIT DISTRIBUTION- SUMMARY

S. No.	Category	Semester								Total Credits	
		I	II	III	IV	V	VI	VII	VIII	NIT	ANNA UNIVERSITY
1.	Humanities and Management Courses(HSMC)	5	4	-	-	3	-	-	-	**12**	**12**
2.	Basic Science Course (BSC)	12	7	4	2	-	-	-	-	**25**	**25**
3.	Engineering Science Course(ESC)	6	6	3	-	-	-	-	-	**15**	**19**
4.	Professional Core Course(PCC)	-	2	16	21	12	10	6	-	**67**	**65**
5.	Professional Elective Course(PEC)	-	-	-	-	6	6	6	-	**18**	**18**
6.	Open Elective Course(OEC)						6	6	-	**12**	**12**
7.	Employability Enhancement Skills/Internship/Project (EEC)	1	1	1	1	1	1	3	08	**17**	**15**
8.	Mandatory Course(MC)	--	--	--	✓	--	✓	--	--	--	--
9.	Vocational Enhancement Course (VEC)	✓	✓	✓	✓	✓	✓	--	--	--	--
Total		**24**	**20**	**24**	**24**	**22**	**23**	**21**	**08**	**166**	**166**

SEMESTER I

Category: HSMC

U23EN101 **ENGLISH FOR ENGINEERS**

L	T	P	C
3	0	0	3

SDG: 4 **(Common to all Branches)**

COURSE OBJECTIVE:

1. To enable learners of engineering and technology to develop their basic communication skills in English.
2. To acquire, command in both the respective skills (listening and reading) and the productive skills (writing and speaking) of the English language.
3. To understand the key concepts of values, life skills and business communication and motivate students to look within and create a better version of themselves.
4. To focus on the development of basic fluency in English, usage of vocabulary in the technical field, and strengthening reading and official written communication skills.
5. To use language efficiently in expressing their opinions via various media.

UNIT 1 **INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION** **9**

Listening– listening to Audio/video(formal & informal);Telephonic conversation (Activity) Speaking Self Introduction;Introducing a friend (Activity);Conversation-politeness strategies; Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts Writing-Writing onself, Writing Definition; Jumbled sentence Grammar – Simple present tense, Present continuous, Present perfect, Present perfect continuous; Question types: Wh/ Yes or No/ and Tags; Word formation, One-wordsubstitution.

UNIT 2 **NARRATION AND SUMMATION** **9**

Listening-Listening to the podcast, anecdotes/stories/event narration; documentaries and interviews with celebrities (Activity). Speaking-Narrating personal experiences/events;interviewing a celebrity (Activity). Reading-Readingbiographies,travelogues,newspaperreports,Writing-Guided writing Paragraph writing,Short Report on an event(fieldtripetc.) - Grammar– Simple past tense, Past continuous, Past perfect, Past perfect continuous; Subject-Verb Agreement;Prepositions, Wordforms(prefixes&suffixes); Error Correction.

UNIT 3 **DESCRIPTION OF PROCESS/PRODUCT** **9**

Listening – Listening to specific audio tracks (Activity) Speaking – Picture description; giving instruction to use the product; presenting a product; Role play (Activity) -Reading – Reading advertisements, gadget reviews; finding key information from a given text- Writing - Instructions; Process description; Grammar - Simple future tense, Future continuous, Future perfect, Future perfect continuous; Imperatives; Adjectives; Degrees of comparison; Compound Words.

UNIT 4 **CLASSIFICATION AND RECOMMENDATIONS** **9**

Listening – watching videos/ documentaries and responding to the questions based on them, Scientific lectures; and educational videos. Speaking – Small Talk; Mini presentations (Activity) -Reading – Journal reports, predicting content of reading habits, Reading articles (Activity)- Writing –Memos to colleagues or friends; Opinion Blogs; Grammar – Articles; Pronouns - Possessive & Relative pronouns, Cause and Effect.

UNIT 5 **EXPRESSION** **9**

Listening – Listening to different accent, Listening to speeches or presentation- Speaking – Debates and Expressing opinions through Simulations, exchanging personal information - (Activity)- Reading – Reading editorials; Poster making (Activity)- Writing – Creative Writing, Checklist- Grammar –Punctuation; Compound Nouns, Homonyms; and Homophones, Simple, Compound & Complex Sentences.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would

CO1: Listen and comprehend complex academic texts.

CO2: Understand the denotative and connotative meanings of technical texts.

CO3: Identify definitions, descriptions, narrations and essays on various topics.

CO4: Apply different methods of integration in solving practical problems.

CO5: Express their opinions effectively in both oral and written medium of communication.

TEXT BOOKS:

1.English for Engineers & Technologist Orient Blackswan PrivateLtd.Department of English, Anna University(2020edition).

2.EnglishforScience&TechnologyCambridgeUniversityPress,2021.

Authored by Dr.VeenaSelvam,Dr.SujathaPriyadarshini,Dr.DeepaMaryFrancis, Dr.KN.Shoba and Dr.Lourdes Joevani,Department of English,Anna University.

REFERENCES:

1. Technical Communication – Principles and Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.

CO's-PO's & PSO's MAPPING															
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PSO 3**
CO1	-	-	-	-	-	1	1	-	3	1	-	2	-	-	-
CO2	-	-	-	-	-	1	1	-	3	-	-	2	-	-	-
CO3	-	-	-	-	-	1	1	-	3	2	-	3	-	-	-
CO4	-	-	-	-	-	1	2	-	3	1	-	2	-	-	-
CO5	-	-	-	-	-	1	2	-	3	2	-	3	-	-	-
Correlation levels: **1 – low** **2 – medium** **3 – high** **"-"- no correlation**															

COURSE DESIGNED BY	**APPROVED BY**
Dr. C. Alice Evangaline Jebaselvi- Professor/English	**Dr.K.ParimalaGandhi** **Professor and Head/S&H**
Name and Department	**Name and Department of BoS Chairman**

Category: BSC

U23MA101 CALCULUS AND DIFFERENTIAL EQUATIONS

L	T	P	C
3	1	0	4

SDG: 4 (Common to all Branches)

COURSE OBJECTIVE:

1. To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
2. To familiarize the students with differential calculus.
3. To enlighten the students with functions of several variables. This is needed in many branches of engineering.
4. To make the students acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
5. To acquaint the students with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT 1 MATRICES 9+3

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (without proof) – Cayley – Hamilton theorem (Statement and applications only) - Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Nature of Quadratic forms - Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT 2 DIFFERENTIAL CALCULUS 9 + 3

Representation of functions - Limit of a function - Continuity - Derivatives -Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications: Maxima and Minima of functions of one variable.

UNIT 3 MULTIVARIABLE CALCULUS 9 + 3

Functions of two variables – Partial derivatives – Total differential – Taylor's series for functions of two variables – Jacobian‘s – Constrained maxima and minima – Lagrange's multiplier and its applications

UNIT 4 ORDINARY DIFFERENTIAL EQUATIONS OF SECOND ORDER 9 + 3

Linear differential equations of second order with constant coefficients. Linear differential Equations of second order with variable coefficients: Cauchy‘s linear differential equation - Method of variation of parameters for second order differential equations

UNIT 5 MULTIPLE INTEGRALS 9 + 3

Double integration with constant and variable limits - Region of integration - Area as double integral in Cartesian coordinates. Triple integral in Cartesian coordinates. Application of integration – Volume of Solids

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to:

CO1: Comprehend the concepts of Eigen values, Eigen vectors, limits, continuity, functions of several variables, double integration and region of integration for solving complex problems.

CO2: Use rules of differentiation to solve maxima and minima problems.
CO3: Apply various techniques in solving ordinary and partial differential equations for practical applications.
CO4: Apply differential and integral calculus tools in modeling problems.
CO5: Evaluate integrals to compute area, volume and other practical problems.

TEXT BOOKS:

1. Grewal.B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 44th Edition 2018.
2. James Stewart, "Calculus : Early Transcendentals", Cengage Learning, 8th Edition, New Delhi,2015.
3. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New delhi,2016.

REFERENCES:

1. Bali. N., Goyal. M. and Watkins. C., ―Advanced Engineering Mathematics‖, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009
2. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New delhi,2016
3. Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016
4. Narayanan. S. and Manicavachagom Pillai. T. K., ―Calculus" Volume I and II, S.Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Jain. R.K. and Iyengar. S.R.K., ―Advanced Engineering Mathematics‖, Narosa Publications, New Delhi, 5th Edition, 2016.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	3	3	3	1	1	3	-	-	-	-	-	-	-	-	-
CO 2	3	3	1	-	-	3	-	-	-	-	-	-	-	-	-
CO 3	3	3	2	-	1	3	-	-	-	-	-	-	-	-	-
CO 4	3	3	3	-	-	3	-	-	-	-	-	-	-	-	-
CO 5	3	3	2	1	-	3	-	-	-	-	-	-	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.N.Vithya/Professor Mathematics	Dr.K.ParimalaGandhi Professor and Head/S&H
Name and Department	Name and Department of BoS Chairman

U23PH101 ENGINEERING PHYSICS Category: BSC
SDG: 4

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. Understand the basics of Properties of Matter and apply them to Engineering.
2. Explore the applications of Lasers and Fiber optics in engineering contexts.
3. Apply principles of Ultrasonics and Thermal Physics to Engineering challenges.
4. Grasp foundational Quantum Physics concepts and their modern applications.
5. Analyze Crystal systems and their structures in Engineering and Technology.

UNIT 1 PROPERTIES OF MATTER 9

Elasticity – Stress-strain diagram and its uses - Factors affecting elastic modulus – Torsional stress and deformations –Torsion pendulum: theory and experiment - Bending of beams - Bending moment – Cantilever: theory and experiment – Uniform and non-uniform bending: theory and experiment - I-shaped girders - Applications. – Basic Solved Problems.

UNIT 2 LASER AND FIBER OPTICS 9

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping- Einstein‘s A and B coefficients: derivation. Types of lasers – Nd-YAG, CO_2- Industrial Applications of Lasers –Fiber Optics: Principle and propagation of light – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – Temperature and displacement sensors.

UNIT 3 ULTRASONICS AND THERMAL PHYSICS 9

Introduction – Piezoelectric effect - piezoelectric generator - Velocity measurement – Acoustic grating – Ultrasonic Medical applications - Introduction to heat - Transfer of heat energy :Thermal conduction, convection and radiation –Thermal conductivity - Forbe‘s and Lee‘s disc method: theory and experiment – Applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT 4 QUANTUM PHYSICS 9

Black body radiation – Planck‘s theory (derivation) – Deduction of Wien‘s displacement law and Rayleigh-Jeans‘ Law from Planck‘s theory – Compton effect :Theory and experimental verification – Matter waves – Schrödinger‘s wave equation: Time independent and time dependent equations – Physical significance of wave function – Particle in a one-dimensional box - Microscope: Scanning Tunnelling microscope.

UNIT 5 CRYSTAL PHYSICS 9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – ‗d‘ spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures – Polymorphism and allotropy - Crystal defects – Point, line and surface defects- Burger vector.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would

CO1: Realize the fundamental engineering ideas of matter, optics, heat, sound, and quantum theory. **CO2:** Demonstrate a solid understanding of fundamental matter properties, Laser and Fiber optics classification, Quantum concepts and apply them successfully to solve practical engineering problems. **CO3:** Apply the

elastic modulus theory, Fiber Optic Sensors, Ultrasonics and thermal applications to integrate knowledge and problem solve at an advanced level.

CO4: Categorize structures to implement in Engineer problems in Material Science and electronics.

CO5: Analyze the foundational Quantum and Crystal Physics concepts to implement solutions for modern engineering problems.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. ―Engineering Physics‖. Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. ―Engineering Physics‖. Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. &Chaturvedi, S. ―Engineering Physics‖. Cengage Learning India, 2012

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. ―Principles of Physics‖. Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. ―Physics for Scientists and Engineers‖. Cengage Learning, 2010.
3. Palanisamy P.K. Engineering Physics. SCITECH Publications, 2011.
4. Kittle,C,: Introduction to solid state Physics:, Wiley, 2005.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	1	-	1	-	1	-	-	1	-	1	-	-	-
CO2	3	3	1	-	1	-	1	-	1	-	-	1	-	-	-
CO3	3	3	1	-	1	-	1	-	1	-	-	1	-	-	-
CO4	3	2	1	-	1	-	-	-	-	1	-	1	-	-	-
CO5	3	3	1	-	-	-	1	-	1	-	-	1	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.T.Jayaprakash/ Professor Physics	Dr.K.ParimalaGandhi Professor and Head/S&H
Name and Department	Name and Department of BoS Chairman

U23CY101 ENGINEERING CHEMISTRY Category: BSC

SDG: 9

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. Learn boiler feed water requirements, and water treatment techniques.
2. To acquire knowledge about the preparation, properties and applications of polymers.
3. Understand the basic concepts of electrochemistry and its applications.
4. Learn corrosion control and protective techniques.
5. Acquire the knowledge about the fuels and properties of energy storage devices.

UNIT 1 WATER TECHNOLOGY 9

Introduction - Sources of water - Impurities in water - Types of water –Hardness of water - Expression of hardness - Units of hardness - Estimation of hardness of water by EDTA method - Disadvantages of using hard water - Boiler troubles - Scale and sludge - Softening of water - External treatment method - Demineralization process - Internal treatment process – Carbonate, Phosphate and Calgon conditioning - Desalination by reverse osmosis method.

UNIT 2 POLYMERS 9

Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Types: Addition, condensation and copolymerization and mechanism of Addition polymerization (Free Radical); Techniques of polymerization: Bulk, emulsion, solution and suspension. Preparation, properties and uses of Nylon (6,6 and 11) and Epoxy resin. Engineering application of plastics- PVC, PTFE and Bakelite. Types of compounding of plastics- Moulding, injection moulding.

UNIT 3 ELECTRO CHEMISTRY 9

Electrochemistry**:** Introduction - Cells - Representation of a galvanic cell - Reversible and irreversible cells - Electrode potential - Nernst equation - Reference electrode (Calomel electrode) - Standard hydrogen electrode - Glass electrode - Electrochemical series and its applications – Battery: Introduction, Types of batteries- alkaline battery- lead storage battery - H_2 -O_2 fuel cell- applications. Construction of solar cells and E-Vehicle.

UNIT 4 CORROSION AND ITS CONTROL 9

Introduction - Chemical corrosion and Wet corrosion - Galvanic and differential aeration (Pitting, Crevice and Pipeline) - Factors influencing rate of corrosion - Corrosion- causes- factors- corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method- Cathodic protection method.

UNIT 5 FUELS AND COMBUSTION 9

Introduction - Classification of fuels - Requirements of a good fuel – Combustion: Principle of combustion - Calorific value - Gross and net calorific values - Explosive range - Spontaneous ignition temperature. Fuels: Solid fuels - Coal and its varieties - Proximate analysis - Significance - Metallurgical coke - Otto-Hoffman byproduct method - Liquid fuel: Manufacture of synthetic petrol - Bergius method - Knocking - Octane number - Cetane number - Gaseous fuel: Liquefied petroleum gas (LPG), Compressed natural gas (CNG).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would

CO1: Recall the concept about water technology, engineering polymers, electrodes, corrosion and combustion of fuels.

CO2: Understand the boiler problems and categorize the polymers.
CO3: Classify plastics, batteries, corrosion, and the calorific value of fuels.
CO4: Apply enough knowledge of contemporary water softening, polymerization, fuel cell, electrochemical protection, and fuel manufacturing procedures.
CO5: Analyze the hardness of water using the EDTA technique and characterization of coal.

TEXT BOOKS:

1. Jain P C and Monica Jain, ―Engineering Chemistry‖, 17th Edition, Dhanpat Rai Publishing Co., 2018. Sivasankar B., ―Engineering Chemistry‖, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2017.

REFERENCES:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, ―Textbook of nanoscience and nanotechnology‖, Universities Press-IIM Series in Metallurgy and Materials Science, 2018. 2. O.G. Palanna, ―Engineering Chemistry‖ McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, ―Engineering Chemistry‖, Scientific International Pvt, Ltd, New Delhi, 2017.
4. Shikha Agarwal, ―Engineering Chemistry-Fundamentals and Applications‖, Cambridge University Press, Delhi, Second Edition, 2019.
5. R.D. Madan, ―Modern Inorganic Chemistry‖, S. Chand, New Delhi, 2012 6. S.S. Dara, ―A Textbook of Engineering Chemistry‖, S. Chand Publishing, 12th Edition, 2018.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	-	-	2	-	-	2	-	-	-	-	1	-	-	-
CO2	3	-	-	2	2	-	2	-	-	-	-	2	-	-	-
CO3	3	-	-	2	2	-	2	-	-	-	-	2	-	-	-
CO4	3	-	-	2	3	-	2	-	-	-	-	3	-	-	-
CO5	3	-	-	2	3	-	2	-	-	-	-	3	-	-	-
CO6	3	-	-	2	2	-	2	-	-	-	-	2.2	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.K.ParimalaGandhi Professor and Head/S&H	Dr.K.ParimalaGandhi Professor and Head/S&H
Name and Department	Name and Department of BoS Chairman

Category: ESC

		L	T	P	C
U23GE101	**ENGINEERING GRAPHICS**	**2**	**0**	**3**	**4**

SDG:8

COURSE OBJECTIVE:

1. Draw engineering curves of simple objects.
2. To Draw the orthographic projection of solids and section of solids.
3. Draw the development of surfaces.
4. Draw the isometric projections of simple solids.
5. Model a simple object using a CAD software.

CONCEPTS AND CONVENTIONS (Not for Examination) 2

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets - Lettering and dimensioning.

UNIT 1 PLANE CURVES 10

Basic Geometrical constructions, Curves used in engineering practices: Conics -Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid - Construction of involutes of circle - Drawing of tangents and normal to the above curves.

UNIT 2 PROJECTION OF POINTS, LINES AND PLANES 10

Orthographic projection - principles - Principal planes - First angle projection -projection of points. Projection of straight lines - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces).

UNIT 3 PROJECTION OF SOLIDS 10

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids by rotating object method.

UNIT 4 PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 10

Sectioning of solids in simple vertical position - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids cylinders and cones.

UNIT 5 ISOMETRIC PROJECTIONS 10

Principles of isometric projection - isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders and cones.

MODELING OF SIMPLE OBJECTS (Not for Examination) 8

Practicing three-dimensional modeling of simple objects by CAD Software.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students would

CO1: Remember the concept of C programming to understand the functional knowledge about operators and the keywords used.
CO2: Demonstrate C program for data types, looping & array.
CO3: Illustrate the basics for functions, structures, pointers and union.
CO4: Make use of the concept to perform the operations dynamic memory allocation, searching and recursion.
CO5: Examine the file processing for sequential, random access and command line arguments.

TEXT BOOKS:

1. Venugopal K. and Prabhu Raja V., ―Engineering Graphics", New Age International (P) Limited, 2008.
2. Natrajan K.V., ―A Text Book of Engineering Graphics‖, Dhanalakshmi Publishers, Chennai, 2018. 3. Jeyapoovan T., ―Engineering Graphics", Newdelhi Vikas Publishing House, 2007.

REFERENCES:

1. Parthasarathy N. S. and Vela Murali, ―Engineering Graphics‖, Oxford University, Press, New Delhi, 2015.
Kulkarni D; Rastogi; Sarkar, ―Engineering Graphics with AUTOCAD‖, Newdelhi Prentice Hall of India, 2009

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	2	2	-	2	-	-	-	2	-	-	2	1	2	1
CO2	2	2	2	-	2	-	-	-	2	-	-	3	2	2	1
CO3	3	3	2	-	2	-	-	-	2	-	-	2	2	2	1
CO4	2	2	2	-	3	-	-	-	2	-	-	3	2	2	1
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	3	1

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.S.SathishKumar/Assistant Professor **Department of Aeronautical Engineering**	**Dr.K.ParimalaGandhi** **Professor and Head/S&H**
Name and Department	**Name and Department of BoS Chairman**

Category : HSMC

U23HS101	**HERITAGE OF TAMIL**	**L**	**T**	**P**	**C**
SDG:4		**1**	**0**	**0**	**1**

COURSE OBJECTIVE:

1.To learn the extensive literature of classical tamil

2.To review the fine arts heritage of tamil culture

3.To realize the contribution in Indian freedom struggle

UNIT 1 LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT 2 HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT 3 FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT 4 THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT 5 CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

At the end of the course, students would

CO1: Remember the extensive literature of tamil and its classical nature, musical instruments, Folk, thinai concept, Indian Freedom Struggle& Aham, Puram and Aram Concept

CO2: Remember the principles in Thirukural, Bakthi Literature Azhwars and Nayanmars , heritage of sculpture, painting and musical instruments of ancient people, victory of chozha dynasty

CO3: Understand on folk and martial arts of tamil people, Justice in Sangam Literature, Development of Modern literature in Tamil, Making of musical instruments

CO4: Understand the role of Temples in Social and Economic Life of Tamils, Ancient Cities and Ports of Sangam Age, Conquest of Cholas

CO5: Understand the Cultural Influence of Tamils over the other parts of India, contribution of tamils selfesteem movement and siddha medicine, Print History of Tamil Books

REFERENCES:

1.Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

2.Historical Heritage of the Tamils (Dr .S. V. Subaramanian, Dr .K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

3.The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies)

4. Keeladi - _Sangam City Civilization on the banks of river Vaigai‘ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

5.Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

CO’s-PO’s & PSO’s MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO2	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO3	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO4	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO5	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high “-“- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.A.Prabakaran/Assistant Professor Tamil	Dr.K.ParimalaGandhi Professor and Head/S&H
Name and Department	Name and Department of BoS Chairman

U23EE101

CAREER ENHANCEMENT TRAINING I

SDG: 17

L	T	P	C
1	0	2	1

COURSE OBJECTIVE:

1. To improve mathematical and analytical abilities of students, particularly in the context of comprehending engineering concepts and making data-driven decision.
2.To develop critical thinking skills including problem solving, logic, patterns, and reasoning.
3. To Comprehend and appreciate mathematical terminologies and concepts in order to understand, interpret, and represent science and technology.

UNIT 1 FUNDAMENTALS 6

Divisibility Test - Square root and Cube roots – HCF & LCM - problems on Numbers

UNIT 2 ALGEBRA 5

Simplification – Surds & Indices – Linear & Quadratic Equations

UNIT 3 BANKING ESSENTIALS 8

Average – Percentage – Profit & Loss – Simple Interest – Compound Interest **UNIT 4 TIME AND EFFICIENCY 8**

Time Speed Distance – Problems on Trains – Boats & Streams – Time & Work – Pipes & Cisterns **UNIT 5 LOGICAL REASONING 3**

Number & letter series – Analogy– Pattern classification – Coding & Decoding

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, students would

CO1: Exhibit a clear understanding of fundamental concepts of aptitude for engineering.

CO2: Demonstrate problem-solving skills and critical thinking abilities in the context of recruitment aptitude tests.

CO3: To use appropriate strategies and shortcuts to improve speed and accuracy in solving aptitude problems during recruitment processes.

CO4: Evaluate and interpret aptitude test results to identify areas of improvement and develop a personalized study plan for further enhancement.

TEXT BOOKS:

1. The Pearson Guide to Quantitative Aptitude For Competitive Examinations, Dinesh Khattar. Pearson
2. Quantitative Aptitude Dr. R.S. Aggarwal S. Chand Publication.
3. A modern Approach to Verbal and Non-Verbal Reasoning R.s. Aggarwal

4. ***REFERENCES:***

1.Quantitative Aptitude for CAT, Arun Sharma.
2.Fast Track Objective Arithmetic, Rajesh Verma, Arihant Publication.
3. Quantitative Aptitude Quantum CAT Common Admission Tests for Admission into IIMs, Sarvesh K. Verma.

4. Effective Communication Skill,Kulbhusan Kumar,RS Salaria,Khanna Publishing House.
5.Wiley's Exam Expert Quantitative Ability for CAT, 2ed, Ashu Jain.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO3
CO 1	3	3	3	3	-	-	-	-	-	-	-	-			
CO 2	3	2	1	3	-	-	-	-	-	-	-	-			
CO 3	3	1	1	2	-	-	-	-	-	-	-	-			
CO 4	1	1	1	1	-	-	-	-	-	-	-	-			
CO 5	-	-	-	-	-	-	-	-	-	-	-	-			

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Ramesh Raja M/Placement	Dr.K.ParimalaGandhi Professor and Head/S&H
Name and Department	Name and Department of BoS Chairman

U23BS111 **BASIC SCIENCE LABORATORY** **Category:BSC**

L	T	P	C
0	0	2	2

SDG: 4 & 9

COURSE OBJECTIVE:

1. Realize the fundamental engineering ideas of matter, optics, heat, sound, and quantum theory.
2. Demonstrate a solid understanding of fundamental matter properties, Laser and Fiber optics classification, Quantum concepts and apply them successfully to solve practical engineering problems.
3. Apply the elastic modulus theory, Fiber Optic Sensors, Ultrasonics and thermal applications to integrate knowledge and problem solve at an advanced level.
4. Categorize the Elastic moduli concepts, Fiber optic lasers and Crystal structures to implement in Engineer problems in Material Science and electronics.
5. Analyse the foundational Quantum and Crystal Physics concepts to implement solutions for modern engineering problems.

PHYSICS - LIST OF EXPERIMENTS (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young‘s modulus - Non uniform bending method.
3. Determination of Young‘s modulus - Uniform bending method.
4. Determination of thickness of a thin wire – Air wedge method.
5. Determination of the wavelength of the laser using grating .
6. Determination of Numerical Aperture and acceptance angle using Optical fibre.
7. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
8. Determination of thermal conductivity of a bad conductor – Lee‘s Disc method.
9. Melde‘s string experiment.
10. Determination of Band gap of a semiconductor.

CHEMISTRY- LIST OF EXPERIMENTS (Any 5 Experiments)

1. Estimation of total, temporary and permanent hardness of water by EDTA method.
2. Estimation of alkalinity of the given water sample.
3. Determination of chloride content of water sample by Argentometric method.
4. Determination of strength of given hydrochloride acid using pH meter
5. Determination of DO content of water sample by Winkler‘s method.
6. Conduct metric titration strong acid Vs Strong Base.
7. Estimation of BOD of the given water sample.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of Iron content by spectrophotometer.
10. Estimation of sodium present in water using flame photometer.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students would

CO1: Apply Physics principles of elasticity to evaluate engineering properties of materials.

CO2: Analyze the physical principle involved in various instruments in acoustics, optics and thermal physics.

CO3: Characterize the quality of water samples with respect to their acidity, alkalinity and hardness.

CO4: Apply chemistry principles to evaluate DO, BOD, Iron content of the given samples.

CO5: Analyze the strength and amount of acids using pH, potentiometer, conductivity meter and the amount of chloride, sodium iron using Argentometric method and flame photometer for the given solution.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO 3
CO1	3	2	1	1	-	-	1	-	1	-	-	-			
CO2	3	2	1	1	-	-	1	-	1	-	-	1			
CO3	3	2	1	1	-	-	1	-	1	-	-	-			
CO4	3	2	1	1	-	-	1	-	1	-	-	1			
CO5	3	2	-	1	-	-	1	-	1	-	-	1			

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.T.JayaPrakash/Dr.K.ParimalaGandhi Professor and Head/S&H	**Dr.K.ParimalaGandhi Professor and Head/S&H**
Name and Department	**Name and Department of BoS Chairman**

U23EN111

COMMUNICATIVE ENGLISH LABORATORY

L	T	P	C
0	0	2	1

SDG: 4

COURSE OBJECTIVE:

1. To enable learners of engineering and technology to develop their basic communication skills in English.
2. To acquire, command in both the respective skills (listening and reading) and the productive skills (writing and speaking) of the English language.
3. To understand the key concepts of values, life skills and business communication and motivate students to look within and create a better version of themselves.
4. To focus on the development of basic fluency in English, usage of vocabulary in the technical field, and strengthening reading and official written communication skills.
5. To use language efficiently in expressing their opinions via various media.

LIST OF EXPERIMENTS:

1. Conversation: Introduction to classmates-Audio/Video(formal & informal)
2. Self Introduction
3. Telephone Conversation
4. Listening to voicemail & messages
5. Listening and filling a form
6. Debate
7. Group Discussion
8. Exchanging personal Information
9. Introducing a friend politeness strategy
10. Essay Writing

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, students would

CO1: Listen and comprehend complex academic texts.

CO2: Understand the denotative and connotative meanings of technical texts.

CO3: Identify definitions, descriptions, narrations and essays on various topics.

CO4: Apply different methods of integration in solving practical problems.

CO5: Express their opinions effectively in both oral and written medium of communication.

CO’s-PO’s & PSO’s MAPPING															
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO 1	3	2	3	1	1	1	-	-	2	-	2	2	2	2	-
CO 2	3	2	2	2	1	1	-	-	2	-	2	2	3	3	-
CO 3	3	2	3	2	1	2	-	-	2	-	2	2	2	2	-
CO 4	3	2	2	2	1	2	-	-	3	-	2	3	3	3	-
CO 5	3	2	3	1	1	2	-	-	3	-	2	3	2	3	-
Correlation levels:			**1 – low**			**2 – medium**				**3 – high**			**“-“- no correlation**		

COURSE DESIGNED BY	APPROVED BY
Dr. C. Alice Evangaline Jebaselvi- Professor/English	**Dr.K.ParimalaGandhi Professor and Head/S&H**
Name and Department	**Name and Department of BoS Chairman**

Category: ESC

U23GE111 ENGINEERING PRACTICES LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVE:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
2. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts.
3. Assembling simple mechanical assembly of common household equipment‘s; Making a tray out of metal sheet using sheet metal work.
4. Wiring various electrical joints in common household electrical wire work.
5. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components.

LIST OF EXPERIMENTS:

GROUP A (CIVIL & MECHANICAL)
PART I CIVIL ENGINEERING PRACTICES:

Plumbing Work

1. Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
2. Preparing plumbing line sketches.
3. Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

Wood Work

4. Sawing
5. Plan
6. Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

PART II MECHANICAL ENGINEERING PRACTICES

Welding Work

1. Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
2. Practicing gas welding.

Basic Machining Work

1. Simple Turning
2. Simple Drilling
3. Simple Tapping

Machine Assembly Practice

1. Study of centrifugal pump
2. Study of air conditioner

Sheet Metal Work

1. Making of a Square tray

GROUP B (ELECTRICAL & ELECTRONICS)
PART I ELECTRICAL ENGINEERING PRACTICES

1. Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin sockets.
2. Staircase wiring.
3. Fluorescent Lamp wiring with introduction LED types.
4. Energy meter wiring and related calculations/ calibration
5. Study of Iron Box wiring and assembly

PART II ELECTRONIC ENGINEERING PRACTICES

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
1. Study of logic gates AND, OR, EX-OR and NOT.
2. Generation of Clock Signal.
3. Soldering simple electronic circuits and checking continuity.
4. Assembly and dismantle of LED TV.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Fabricate carpentry components and pipe connections including plumbing works.

CO2: Use welding equipments to join the structures.

CO3: Carry out the basic assembling and machining operations; Make the models using sheet metal works.

CO4: Carry out basic home electrical works and appliances and to measure the electrical quantities.

CO5: Soldering the simple electronic circuits; Assemble the simple electronic devices.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	-	-	1	1	-	-	-	-	-	2	2	1	1
CO2	3	2	-	-	1	1	-	-	-	-	-	2	2	1	1
CO3	3	2	-	-	1	1	-	-	-	-	-	2	2	1	1
CO4	3	2	-	-	1	1	-	-	-	-	-	2	2	1	1
CO5	3	2	-	-	1	1	-	-	-	-	-	2	2	1	1

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.S.Sathish Kumar/Assistant Professor Aeronautical Engineering	Dr.K.ParimalaGandhi Professor and Head/S&H
Name and Department	Name and Department of BoS Chairman

SEMESTER II

	DESIGN OF EXPERIMENT	**Category: BSC**
U23MA203	**AND**	**L T P C**
SDG: 4	**NUMERICAL METHOD**	
		3 1 0 4

COURSE OBJECTIVE:

1. Learn basic concepts of statistical and numerical methods as well as numerical problem solving procedure for planning marketing strategies
2. Gain the knowledge of testing of hypothesis for samples and design of experiments
3. Understand the basic concepts in solving algebraic and transcendental equations
4. Adopt the numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines
5. Develop the various techniques and methods of solving ordinary differential equations

UNIT 1 **TESTING OF HYPOTHESIS** **9+3**

Large Sample Test: Single Mean and Difference of two Means. Small Sample Test - Student‘s t Test - Single Mean-Difference of Two Means-F Test- Chi Square Test-Goodness of Fit - Test of Independence Attributes – Application- Comparative Analysis - Quality Testing.

UNIT 2 **DESIGN OF EXPERIMENTS** **9+3**

Analysis of Variance: One way and two-way classifications - Completely randomized design – Randomized block design – Latin square design. Application: Response Surface Methodology.

UNIT 3 **ALGEBRAIC AND TRANSCENDENTAL EQUATIONS** **9+3**

Solution of algebraic and transcendental equations–Newton Raphson method - Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel Method. Application: System of Communications.

UNIT 4 **NUMERICAL DIFFERENTIATION AND INTEGRATION** **9+3**

Interpolation Using Newton‘s Forward and Backward Difference Formulae – Numerical Integration(Single): Trapezoidal Rule and Simpson‘s 1/3rd and 3/8 Rules. Application: The determination of discontinuous points in Image processing.

UNIT 5 **SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS** **9+3**

Taylor’s series method - Euler‘s method - Modified Euler‘s method – Fourth orders Runge-Kutta method for solving first order differential equations. Application: Electrical circuits, Chemical reactions and Mechanical system.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would

CO1: Taylor’s series method - Euler‘s method - Modified Euler‘s method – Fourth orders Runge-Kutta method for solving first order differential equations. Application: Electrical circuits, Chemical reactions and Mechanical system.

CO2: Tests for single mean, Equality of variance, Chi square test for goodness of fit and Solution of linear equations.

CO3: Apply the numerical techniques of differentiation and integration for engineering problems and solving Ordinary Differential Equations.

CO4: Analyze the concepts of classifications of design of experiments and linear equations in the field of Engineering and Technology.

CO5: Solve the ordinary differential equations using certain techniques with engineering applications.

TEXT BOOKS:

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics forEngineers", Pearson Education, Asia, 8th Edition, 2015.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning,New Delhi, 8th Edition, 2014
3. Gupta S.C. and Kapoor V. K., " Fundamentals of Mathematical Statistics", Sultan Chand &Sons, New Delhi, 12th Edition, 2020
4. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning,New Delhi, 8th Edition, 2014

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO 3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	2.5	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-	2.75	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-	2.75	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.N.Vithya/Professor Mathematics	Dr.K.ParimalaGandhi Professor and Head/S&H
Name and Department	Name and Department of BoS Chairman

U23PH204 **Category: BSC**

SDG: 4

L	T	C	P
3	0	0	3

PHYSICS OF MATERIALS

COURSE OBJECTIVE:

1. Make the students to have a knowledge on the basis of conducting materials, quantum mechanics and about energy bands.
2. Introduce the physics of semiconducting materials and applications of semiconductors in device fabrication.
3. Make the students to learn the origin of magnetism in magnetic materials and their classifications and also it describes the phenomena related microwaves.
4. Equip the students to learn the mechanisms of polarization in dielectric materials, and to learn the physics of superconductivity & various properties exhibited by superconductors. 5. Make the students familiarize in the new materials and it applications.

UNIT 1 ELECTRICAL PROPERTIES OF MATERIALS 9

Conducting materials: Introduction - Classical free electron theory – Electrical and thermal conductivities – Wiedemann- Franz law – Lorentz number –Merits and demerits of classical free electron theory – Quantum free electron theory-Fermi distribution function – Effect of temperature on fermi function - Density of energy states – Carrier concentration in metals - Electron effective mass.

UNIT 2 SEMICONDUCTING PROPERTIES OF MATERIALS 9

Elemental and Compound semiconductors - Intrinsic semiconductor – Carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – Electrical conductivity – Band gap determination – Derivation of carrier concentration in n-type and p-type semiconductor – Variation of Fermi level with temperature and impurity concentration — Hall effect –Determination of Hall coefficient – Applications.

UNIT 3 MAGNETIC MATERIALS AND MICROWAVES 9

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism - Ferromagnetism: saturation magnetization and Curie temperature – Domain theory – Hysteresis – Soft and hard magnetic materials –Antiferromagnetic materials – Ferrites and its applications - Microwaves: Introduction - Conversion of microwaves into heat - Penetration depth and applications.

UNIT 4 DIELECTRIC AND SUPERCONDUCTING PROPERTIES OF MATERIALS 9

Electrical susceptibility –Dielectric constant – Electronic, ionic, orientational and space charge polarization – Frequency and temperature dependence of polarisation – Internal field – Claussius – Mosotti relation (derivation) – Dielectric loss – Dielectric breakdown - Superconductivity: properties – Type I and Type II superconductors – High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT 5 NEW MATERIALS AND APPLICATIONS 9

Metallic glasses - Melt spinning process, applications - shape memory alloys: Ni-Ti alloy, applications – Ceramics - Types and applications – Nanomaterials: Low dimensional structures: quantum dot, quantum wire and quantum well –preparation (bottom up and top down approaches) - Properties and Industrial applications of nanotechnology in food processing and packaging.

TOTAL: 45 PERIODS COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Realize the fundamental properties of classical and quantum mechanics, semiconductor physics and about its energy band, magnetic properties of materials, dielectric materials superconducting materials and the basics of new engineering materials

CO2: Demonstrate a solid understanding of classical and quantum mechanics, semiconductor physics, magnetic properties of materials, dielectric materials and superconducting materials to solve practical engineering problems.

CO3:Apply the basic theory of classical and quantum mechanics, semiconductor physics, magnetic, dielectric materials, superconducting materials to integrate knowledge to various applications.

CO4: Categorize the semiconductor, magnetic, dielectric and superconducting properties of materials and apply it to solve Engineering problems in Material Science.

CO5: Analyse the foundational knowledge of conductor, semiconductor, magnetic, dielectric and superconducting materials to implement solutions for modern engineering problems.

TEXT BOOKS:

1.Arumugam M., Materials Science. Anuradha publishers, 2010
2.Pillai S.O., Solid State Physics. New Age International(P) Ltd., publishers, 2009
3.The Physics and Chemistry of NanoSolids by Frank J. Owens and Charles P. Poole Jr, Wiley-Inter science, 2008

REFERENCE BOOKS:

1.Palanisamy P.K. Materials Science. SCITECH Publishers, 2011
2.Senthilkumar G. Engineering Physics II. VRB Publishers, 2011
3.J.F.Shackelford. Introduction to Materials Science for Engineers. Pearson, 2015

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	PO	PO	PSO1	PSO2	PS O3
CO1	3	3	1	-	1	-	1	-	-	1	-	1	-	-	-
CO2	3	3	1	-	1	-	1	-	1	-	-	1	-	-	-
CO3	3	3	1	-	1	-	1	-	1	-	-	1	-	-	-
CO4	3	2	1	-	1	-	-	-	-	1	-	1	-	-	-
CO5	3	3	1	-	-	-	1	-	1	-	-	1	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.T.JayaPrakash/Professor **Physics**	**Dr.K.ParimalaGandhi** **Professor and Head/S&H**
Name and Department	**Name and Department of BoS Chairman**

U23CE201

ENGINEERING MECHANICS **L T P C**

SDG: 4

3 2 0 3

COURSE OBJECTIVE:

1. To Learn the use scalar and vector analytical techniques for analyzing forces in Statically determinate structures.
2. To introduce the equilibrium of rigid bodies.
3. To study and understand the distributed forces, surface, loading on beam and intensity.
4. To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.
5. To develop basic dynamics concepts – force, momentum, work and energy.

UNIT 1 STATICS OF PARTICLES 9

Introduction – Units and Dimensions – Laws of Mechanics – Lami‘s theorem, Parallelogram and triangular Law of forces (Statement Only) – Vectorial representation of forces – Vector operations of forces - additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Equivalent systems of forces – Principle of transmissibility.

UNIT 2 EQUILIBRIUM OF RIGID BODIES 9

Free body diagram – Types of supports –Action and reaction forces (Beam only) – stable equilibrium – Conditions of equilibrium - Moments and Couples – Moment of a force about a point and about an axis.

UNIT 3 PROPERTIES OF SURFFACES AND SOLIDS 9

Centroids and centre of mass – Centroids sections - Rectangle, Circle, Triangle – T section, I section, - Angle section, Hollow section by using standard formula –Theorems of Pappus (Statement Only) - Area moments of inertia of plane areas – Rectangle, Circle, Triangle, T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem (Statement Only) – Polar Moment of Inertia – Radius of Gyration.

UNIT 4 DYNAMICS OF PARTICLES 9

Introduction – Dynamics - Kinematics & Kinetics – Characteristics of Kinematics - Displacements, Velocity and acceleration, their relationship - Newton‘s laws of motion – Work Energy Equation– Impulse and Momentum.

UNIT 5 FRICTION 9

Friction – Types of friction – Limiting friction – Coulomb‘s law of dry friction – Impending Motion – Angle of Repose – Body on a Rough inclined plane – Simple Contact Friction – Ladder Friction – Screw Friction – Belt Friction.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Illustrate the vectorial and scalar representation of forces and moments

CO2: Analyse the rigid body in equilibrium

CO3: Evaluate the centre of Gravity and Moment of Inertia of an object.

CO4: Calculate dynamic forces exerted in rigid body

CO5: Determine the friction and the effects by the laws of friction

TEXT BOOKS:

Bhavikatti, S.S and Rajashekarappa, K.G., ―Engineering Mechanics‖, New Age International (P) Limited Publishers, 1998

Rajasekaran S and Sankarasubramanian G., ―Engineering Mechanics Statics and Dynamics‖, 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.

REFERENCE BOOKS:

1. R.S.Khurmi. ―A Text Book of Engineering Mechanics, S Chand Publishing, 2019.
2. N.Kottiswaran, ―Engineering Mechanics‖, Sri Balaji Publications, 2013.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	3	2	1	-	-	-	-	-	-	2	3	3	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	3	3	2
CO3	3	3	2	1	1	-	-	-	-	-	-	1	3	3	2
CO4	3	3	3	2	2	-	-	-	-	-	-	1	3	3	2
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3	2

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.R.Bharathi Khanna **Assistant Professor/Agricultural Engineering**	**Dr.K.ParimalaGandhi** **Professor and Head/S&H**
Name and Department	**Name and Department of BoS Chairman**

U23HS202 TAMILS AND TECHNOLOGY L T P C
SDG: 5
1 0 0 1

COURSE OBJECTIVE:

1. To learn the extensive literature of classical Tamil.

2. To review the fine arts heritage of Tamil culture.
3. To realize the contribution in Indian freedom struggle.

UNIT 1 WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT 2 DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT 3 MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT 4 AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT 5 SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project. 4.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

CO1: Understand the extensive literature of Tamil and its classical nature (understand)

CO2: Understand the heritage of sculpture, painting and musical instruments of ancient people (understand)

CO3: Review on folk and martial arts of Tamil people (understand)

CO4: Realization of thinai concepts, trade and victory of chozha dynasty (understand)

CO5: Understand the contribution of Tamils in Indian freedom struggle, self-esteem movement and siddha medicine (understand)

REFERENCE BOOKS:

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO2	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO3	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO4	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-
CO5	-	-	-	-	-	-	3	3	-	2	-	3	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.A.Prabkaran/Assistant Professor Tamil	Dr.K.ParimalaGandhi Professor and Head/S&H
Name and Department	Name and Department of BoS Chairman

U23EN202 **HSMC**

SDG: 4

PROFICIENCY IN ENGLISH

L	T	P	C
2	0	2	3

COURSE OBJECTIVE:

1. To engage learners in meaningful language activities to improve their LSRW skills.

2. To identify personality traits and evolve as a better team player.
3. To develop analytical thinking skills for problem solving in communicative contexts.
4. To demonstrate an understanding of job applications and interviews for internship andplacements.
5. To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.

UNIT 1 MAKING COMPARISONS 9

Listening – Listening to informal conversations (Activity)
Speaking – Role Play - talking about experiences- talking about events in life- discussing past events
Reading - Reading advertisements, Extensive Reading (Activity)
Writing – Reading Comprehension, Writing a review/ summary of story/article.
Grammar – Active voice & Passive voice, Prepositional phrases.

UNIT 2 EXPRESSING CASUAL RELATIONS IN SPEAKING AND WRITING 9

Listening - Listening to longer technical speech, Listening to situation based dialogues
Speaking – discussing news stories -talking about travel problems and procedures
Reading - Reading longer technical texts, Reading a short story
Writing - Personal letter (Inviting your friend), Congratulating letter, Writing responses to complaints and adjustment letter. Grammar - Infinitive and Gerunds, Modals

UNIT 3 PROBLEM SOLVING 9

Listening – Listening to movie scenes/ documentaries depicting a technical problem and suggesting solutions (Activity).Speaking – Conversation skills with a sense of stress, intonation, pronunciation, Welcome address - vote of thanksReading - Case Studies, news reports, reading passages with time limit. Writing – Letter to the Editor, Short report on an event (field trip).Grammar -– If conditional sentence, Phrasal Verbs

UNIT 4 REPORTING OF EVENTS AND RESEARCH 9

Listening – Listening Comprehension based on news reports. Speaking – Presenting an oral report, Talking about past, present and the future (Activity).Reading – Newspaper articles; Reading the job advertisements and the profile of the company. Writing – Essay writing and its types (Compare & Contrast, Cause & Effect, Problem & Solution). Grammar – Reported Speech, Conjunctions

UNIT 5 THE ABILITY TO PUT IDEAS OR INFORMATION TO COGENTLY 9

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Identify cause and effects in events, industrial processes through technical text

CO2: Understand and use tools of structured written communication

CO3: Identify individual personality types and role in a team

CO4: Understand the basics concepts of morality and diversity

CO5: Present their opinion in a planned and logical manner, and draft effective resumes in context of job search.

TEXT BOOKS:

1. English for Engineers & Technologists, Orient Blackswan Private Ltd. Department of English, Anna University, 2020

2. Barun.K.Mithra, Personality Development and Soft Skills, OUP India, 2019

REFERENCE BOOKS:

1. Jack C. Richards, ―Interchange, Student‘s Book‖, 4th Edition, Cambridge University Press, New York, 2017.

2. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	-	-	-	-	-	1	1	-	3	1	-	2	-	-	-
CO2	-	-	-	-	-	1	1	-	3	2	-	2	-	-	-
CO3	-	-	-	-	-	1	1	-	3	2	-	3	-	-	-
CO4	-	-	-	-	-	1	1	-	3	1	-	2	-	-	-
CO5	-	-	-	-	-	1	1	-	3	3	-	3	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr. C. Alice Evangaline Jebaselvi- Professor/English	Dr.K.ParimalaGandhi Professor and Head/S&H
Name and Department	Name and Department of BoS Chairman

U23CS203 **C PROGRAMMING** **L T P C**
0 0 2 3

SDG: 4

COURSE OBJECTIVE:

1. To learn the basic constructs of C Programming.
2. To learn arrays and strings concepts of C Programming
3. To learn functions and pointers in C and use pointers for storing data in the main memory efficiently.
4. To learn structures and union concepts of C Programming.
5. To learn Applications of C programs.

UNIT 1 BASICS OF C PROGRAMMING 6

Structure of a _C‘ program - C Tokens: Constants, Variables – Data Types: Primitive Data Types, Type Definition, Operators and Expressions- Managing Input and Output operations

UNIT 2 CONTROL STATEMENTS AND ARRAYS 6

Decision Making: Branching statements, Looping statements- Arrays: Declaration, Initialization, One dimensional, Two dimensional, and Multidimensional arrays

UNIT 3 STRINGS, FUNCTIONS AND POINTERS 6

String: String operations – Function: Declaration, Definition, Parameter passing methods, Recursion – Pointers: Declaration, Definition, Pointers and Functions

UNIT 4 STRUCTURE AND UNION 6

Structure and union - Nested structures – Pointer and Structures – Array of structures – Example Program using structures and pointers.

UNIT 5 APPLICATION OF C PROGRAMMING 6

Applications – Advantages of C in civil Engineering – Analysis and Simulations of Design using C programming – Data Processing - Implementation of C in Design- Case Studies.

LIST OF EXPERIMENTS

1. Programs using simple statements
2. Programs using decision making statements
3. Programs using looping statements
4. Programs using one dimensional and two-dimensional arrays
5. Programs using strings.
6. Programs using user defined functions and recursive functions
7. Programs using functions and pointers
8. Sort the list of numbers using pass by reference.
9. Generate salary slip of employees using structures and pointers
10. Case Studies on Applications of C program in Civil Engineering Design

TOTAL = 30+15 =45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Develop simple applications in C using basic constructs

CO2: Design applications using control statements and arrays

CO3: Develop and implement applications in C using functions and pointers and use pointers for storing data in the main memory efficiently.

CO4: Develop applications in C using structures and union.

CO5: Design Applications using C programming in Civil engineering

TEXT BOOKS:

1. Reema Thareja, ―Programming in C‖, Oxford University Press, Second edition, 2016
2. Beecher K. Computational Thinking: A beginner's guide to Problem-solving and Programming. BCS Learning & Development Limited;2017.

REFERENCE BOOKS:

1. Byron Gottfried. Programming With C. Fourth Edition, McGrawHill, 2018.
2. Paul Deital , Harvey deital, ―C How to Program‖ , 8th Edition , Pearson,2016
3. Yashavant P. Kanetkar. ―Let Us C‖, BPB Publications, 2016.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	-	-	-	-	-	-	1	-	-	-	1	-	-
CO2	3	3	3	-	-	-	-	2	1	-	-	-	1	-	-
CO3	3	3	1	1	-	-	-	2	1	-	-	-	1	-	-
CO4	2	3	3	2	2	-	2	-	1	-	-	-	-	-	-
CO5	2	3	3	2	-	-	-	-	-	-	-	-	1	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.S.Pathur Nisha/Professor Department of Computer Science and Engineering	Dr.S.Pathur Nisha/Professor Department of Computer Science and Engineering
Name and Department	Name and Department of BoS Chairman

U23CE211 **COMPUTER AIDED BUILDING DRAWING LABORATORY** **PCC**
SDG: 9

L	T	P	C
0	0	4	2

COURSE OBJECTIVE:

1. To Develop Skill to use Software to Create 2D and 3D Models
2. To apply basic concept to drawing, edit, dimension, hatching etc. to develop 2D & 3D Modeling.

To make 3D modeling, along with detailing

LIST OF EXPERIMENTS:

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involutes using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V- block, Base of a mix, Simple stool, Objects with hole and curves).
6. Drawing sectional views of prism, pyramid, cylinder, cone, etc
7. Drawing isometric projection of simple objects.
8. Drawing of a simple steel truss.
9. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

TOTAL = 30 PERIODS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Able to choose scale factor and drawing standards
CO2: Ability to use the software packers for drafting and modeling
CO3: Ability to create 2D and 3D models of Engineering Components
CO4: Draw the various building components and also other structural Components.
CO5: Develop the working Drawings and recommend the details as per local bye laws.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	-	3	-	2	3	1	1	3	-	-	1	3	2	-
CO2	3	2	3	-	2	3	1	2	3	2	-	1	3	2	2
CO3	3	2	3	-	2	3	2	2	3	2	2	3	3	2	2
CO4	3	2	3	2	2	3	2	1	3	2	2	3	3	2	2
CO5	3	2	3	2	2	3	2	2	3	2	2	3	3	2	2

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23EE202
SDG: 10

CAREER ENHANCEMENT TRAINING II **Category:EEC**

L	T	P	C
3	0	0	1

COURSE OBJECTIVES:

1. To help students demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
2. To enable students critically evaluate various real-life situations by resorting to an analysis of key issues and factors.
3. To help them improve their communicative English for Interview and corporate readiness

LIST OF EXPERIMENTS:

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involutes using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V- block, Base of a mix, Simple stool, Objects with hole and curves).
6. Drawing sectional views of prism, pyramid, cylinder, cone, etc
7. Drawing isometric projection of simple objects.
8. Drawing of a simple steel truss.
9. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

TOTAL = 30 PERIODS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Demonstrate problem-solving skills and critical thinking abilities in the context of Engineering Aptitude

CO2: To use appropriate strategies and shortcuts to improve speed and accuracy in solving aptitude problems during recruitment processes.

CO3: Evaluate and interpret aptitude test results to identify areas of improvement and develop a personalized study plan for further enhancement.

CO4: Use the correct Grammar, Vocabulary, Spelling and Comprehension ensuring the enhancement their language skills and the ability to use the skills for effective Communication

CO5: To improve the Communication skills for the self-introduce in the Interview.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	3	3	-	-	-	-	-	1	-	-	-	-	-
CO2	3	2	1	3	-	-	-	-	-	1	-	-	-	-	-
CO3	3	1	1	2	-	-	-	-	-	1	-	-	-	-	-
CO4	1	1	1	1	-	-	-	-	-	3	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Ramesh Raja M/Placement	**Dr.K.ParimalaGandhi** **Professor and Head/S&H**
Name and Department	**Name and Department of BoS Chairman**

U23MA30	FOURIER ANALYSIS AND PARTIAL DIFFERENTIAL EQUATIONS	Category: BSC			
4 SDG: 4		L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

1. To impart knowledge on partial differential equations.
2. To construct Fourier series for different periodic functions and to evaluate infinite series.
3. To classify different types of PDE and solve boundary value problems.
4. To acquaint the student with different transform techniques used in wide variety of situations.
5. To solve difference equations using Z – transforms that arise in discrete time systems.

UNIT 1 PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations — Singular integrals — Solutions of standard types of first order partial differential equations — Lagrange‘s linear equation - Linear partial differential equations of second order with constant coefficients of homogeneous types. Application: Modeling one dimensional dynamic problems

UNIT 2 FOURIER SERIES 9 + 3

Dirichlet‘s conditions — General Fourier series — Odd and even functions — Half range sine series — Half range cosine series — Parseval‘s Identity - Harmonic analysis. Application: Modeling of vibrating membrane using Fourier series

UNIT 3 BOUNDARY VALUE PROBLEMS 9 + 3

Classification of PDE –Fourier series solutions of one-dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two- dimensional equation of heat conduction. Application: wave propagation in cylinders

UNIT 4 FOURIER TRANSFORMS 9 + 3

Fourier Transform, Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval‘s identity. Application: Medical Imaging

UNIT 5 Z TRANSFORMS AND DIFFERENCE EQUATIONS 9 + 3

Z-transforms — Elementary properties — Inverse Z-transform (using partial fraction and residues) — Initial and final value theorems — Convolution theorem — Formation of difference equations — Solution of difference equations using Z — transform. Application: Image analysis

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to:

CO1:State and define differential equations using Fourier series analysis and Steady state solution, Transform of simple functions which plays a vital role in Engineering applications.

CO2: Understand how to solve the given standard partial differential equations, Odd and Even functions using Fourier series, Classification of PDE, Fourier transform pair and Elementary properties using Z – Transforms.

CO3:Apply the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations, Appreciate the same in solving Convolution theorem by Transforms

CO4:Analyze the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

CO5:Evaluate the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems and Steady state solutions and Harmonic Analysis.

TEXT BOOKS:

1. Grewal B.S., “Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2018.

2. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

3. Kreyszig E, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, New Delhi, India, 2018.

REFERENCES:

1. Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999.

2. James. G., "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, New Delhi,2016.

3. Wylie. R.C. and Barrett . L.C., “Advanced Engineering Mathematics “Tata McGraw Hill Education Pvt.Ltd, 6th Edition, New Delhi, 2012

4. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2021.

5. Narayanan. S.Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998

CO’s-PO’s & PSO’s MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO	3	2	1	-	-	-	-	-	1	-	-	1	-	-	-
CO	3	2	1	-	-	-	-	-	1	-	-	1	-	-	-
CO	3	3	2	-	-	-	-	-	1	-	-	1	-	-	-
CO	3	2	3	-	-	-	-	-	1	-	-	1	-	-	-
CO	3	3	1	-	-	-	-	-	1	-	-	1	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high “-“- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.N.Vithya/Professor Mathematics	Dr.K.ParimalaGandhi Professor and Head/S&H
Name and Department	Name and Department of BoS Chairman

U23CE301 STRENGTH OF MATERIALS I Category: PCC
SDG: 9

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. To learn the fundamental concepts of stress, strain and deformation of solids.
2. To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
3. To learn about slope and deflection of structures.
4. To understand the effect of torsion on shafts and spring.
5. To analyze plane and space trusses.

UNIT 1 STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Simple Stresses and strains – Elastic constants - Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Deformation of axially loaded member - Composite Bars - Thermal Stresses – State of Stress in two dimensions – Stresses on inclined planes – Principal Stresses and Principal Planes – Maximum shear stress - Mohr's circle method

UNIT 2 TRANSFER OF LOADS AND STRESSES IN BEAMS 9

Types of loads, supports, beams – concept of shearing force and bending moment - Relationship between intensity of load, Shear Force and Bending moment - Shear Force and Bending Moment Diagrams for Cantilever, simply supported and overhanging beams with concentrated load, uniformly distributed load, uniformly varying load and concentrated moment. Theory of Simple Bending – Stress Distribution due to bending moment and shearing force - Flitched Beams - Leaf Springs.

UNIT 3 DEFLECTION OF BEAMS 9

Elastic curve – Governing differential equation - Double integration method - Macaulay's method - Area moment method - conjugate beam method for computation of slope and deflection of determinant beams.

UNIT 4 TORSION 9

Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – springs in series and parallel – Design of buffer springs.

UNIT 5 ANALYSIS OF TRUSSES 9

Determinate and indeterminate trusses - Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient – Analysis of Space trusses by tension coefficient method.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Rajput.R.K. “Strength of Materials”, S.Chand and Co, New Delhi, 2015.
2.Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS –I Strength of materials, Laxmi publications. New Delhi, 2015.

REFERENCES:

1. Timoshenko.S.B. and Gere.J.M, “Mechanics of Materials”, Van Nos Reinbhold, New Delhi 1999.
2. Vazirani.V.N and Ratwani.M.M, “Analysis of Structures”, Vol I Khanna Publishers, New Delhi,1995.

3. Junnarkar.S.B. and Shah.H.J, “Mechanics of Structures”, Vol I, Charotar Publishing House, New Delhi 2016
4. Singh. D.K., “ Strength of Materials”, Ane Books Pvt. Ltd., New Delhi, 2016
5.Basavarajaiah, B.S. and Mahadevappa, P., Strength of Materials, Universities Press, Hyderabad, 2010.
6. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.

CO’s-PO’s & PSO’s MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3
CO1	-	2	1	2	1	-	-	-	2	1	-	-	2	-	2
CO2	3	-	2	1	-	-	-	-	1	-	-	-	-	1	-
CO3	-	2	-	2	3	-	-	-	3	1	-	-	-	2	1
CO4	2	2	1	-	-	-	-	-	-	-	2	-	2	-	-
CO5	1	-	2	-	2	-	-	-	-	2	-	-	1	2	1

Correlation levels: 1 – low 2 – medium 3 – high “-“- no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.P.Siddharthan/ Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE302 **FLUID MECHANICS** **Category: ESC**
SDG: 4

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. To study the concepts of fluid mechanics.
2. To understand the closed conduit flow in different flow condition.
3. To understand the open channel flow types.
4. To understand the application of Dimensional analysis in similitude and model study
5. To study the concepts of hydraulic machines viz. flow through turbines and pumps.

UNIT 1 FLUID PROPERTIES AND FLUID STATICS 9

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility,vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges-on planes – centre of pressure – bouncy and floatation.

UNIT 2 FLIUD KINEMATICS AND DYNAMICS 9

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- Equation of streamline – stream function - velocity potential function - circulation - flow net. Fluid dynamics - equations of motion -Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orificemeter and Pitot tube. Linear momentum equation and its application.

UNIT 3 FLOW THROUGH PIPES 9

Viscous flow - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle's) - Hydraulic and energy gradient – flow through pipes - Darcy - Weisbach's equation - pipe roughness -friction factor- Moody's diagram-major and minor losses in pipes-pipes in serial and in .parallel.

UNIT 4 BOUNDARY LAYER 9

Boundary layer – definition- boundary layer on a flat plate – thickness and classification –displacement , energy and momentum thickness – Boundary layer separation and control – drag in flat plate – drag and lift coefficients.

UNIT 5 DIMENSIONAL ANALYSIS AND MODEL STUDIES 9

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi-theorem-Dimensionless parameters-similitude and model studies-distorted models.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would

CO1: Understand the broad principles of fluid statics, kinematics and dynamics

CO2: Calculate major and minor losses in flow through pipes

CO3: Apply the knowledge of fluid mechanics in addressing problems in open channels flow.

CO4: Apply the principle of dimensional analysis and model analysis in hydraulic engineering problems

CO5: Design and Study the performance of hydraulic machineries (Pumps & Turbines Apply the basics of Computational Fluid Dynamics in solving pipe flow

TEXT BOOKS:

1. Modi P.N and Seth " Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New
Delhi. 2003

2. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 2001.

3. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", 5th edition, Laxmi Publications Pvt. Ltd, New Delhi, 2008.

4. White, F.M., "Fluid Mechanics", Tata McGraw Hill, 5th Edition, New Delhi, 2003.

REFERENCES:

1. Streeter, V.L., and Wylie, E.B., “Fluid Mechanics”, McGraw Hill, 2000.
2. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons,Singapore, 1995.
3. Jain A. K. "Fluid Mechanics", Khanna Publishers, 2010.
4. Roberson J.A and Crowe C.T., " Engineering Fluid Mechanics", Jaico Books Mumbai,2000.

CO’s-PO’s & PSO’s MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3
CO1	2	1		1			1	-	-	1	1	1	2	2	2
CO2	3	3	2	3			1	-	-	1	1	1	2	2	2
CO3	3	2	1	2			1	-	-	1	1	1	1	1	2
CO4	3	2	1	3	2		1	-	-	1	1	1	2	2	1
CO5	3	2	2	2	3		1	-	-	1	1	1	2	2	2

Correlation levels: 1 – low 2 – medium 3 – high “-“- no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/ Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE303 **SURVEYING I** **Category: PCC**

SDG: 9

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. To understand basic principle and concepts of different surveying methods.
2. To study the different surveying equipment in the field of civil engineering.
3. To enhance the ability to calculate surveying quantities.
4. To enable the suitability of surveying instruments and method to a given problem.
5. To develop basic dynamics concepts about Curves.

UNIT 1 INTRODUCTION AND CHAIN SURVEYING 9

Definition and Principles of Surveying – Applications - Classification – Field and Office work – Scales – Conventional Signs. Chain Survey - Instruments – Ranging – Types - Obstacles in Chaining – Chain and Tape corrections - Setting out Perpendiculars – Well conditioned Triangles – Traversing – Enlarging and reducing Maps – Topological maps.

UNIT 2 COMPASS SURVEYING AND PLANE TABLE SURVEYING 9

Prismatic Compass – Surveyor's Compass – Working and use of compass - Bearing – Systems and Conversions – Computation of angles from bearing - Local Attraction - Magnetic Declination – Dip – Traversing – Adjustment of error. Plane Table and Accessories – Radiation, Intersection, Resection – Two point problem - Three point problem.

UNIT 3 LEVELLING AND APPLICATIONS 9

Basic Terms - Types of Level – Fundamental Axes - Levelling staff – Bench Marks – Temporary and Permanent Adjustments – Types of Levelling - Curvature and Refraction correction - Reciprocal Levelling – Calculation of Areas and Volumes – Contouring – Characteristics and Uses of Contours – Methods of contouring.

UNIT 4 THEODOLITE SURVEYING 9

Theodolite – types – Terms - Temporary and Permanent Adjustments – Measurement of Horizontal Angles by Repetition and Reiteration – Closing Error and Distribution – Omitted Measurements.

UNIT 5 CURVES 9

Simple curves - elements - Setting out of curves -Linear and angular methods - Difficulties in setting out - Compound and Reverse curves- elements - Setting out of Vertical Curves.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would

CO1:Able to calculate distances, angles.

CO2:Able to understand about compass and plane table.

CO3:Able to interpret survey data and compute areas and volumes.

CO4:Able to calculate levels of various points.

CO5:Able to know about setting out of curves.

TEXT BOOKS:

1. Kanetkar .T.P, and Kulkarni .S.V, "Surveying and Levelling, Vol. I & II", Pune Vidyarthi Griha Prakashan ,2004.

2. Duggal S.K ."Surveying ,Vol. I & II", Tata McGraw-Hill, Publishing Company, 2004.

3. Basak N.N, "Surveying and Leveling", Tata McGraw-Hill, Publishing Company, 2014.

4. Bhavikatti S.S, "Surveying and Leveling , Vol.I", I.K. International Pvt. Ltd., 2010.

REFERENCES:

1. Charles D Ghilani, Paul R Wolf., Elementary Surveying, Prentice Hall, 2012.

2. Bannister. A & Reynolds. S, "Surveying", ELBS, 1992.

3.Chandra A.M., "Plane Surveying", New Age International Pvt. Ltd, 2015.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3
CO1	3	2	-	1	-	-	-	-	2	-	-	-	-	-	-
CO2	1	-	-	2	-	-	-	-	1	-	-	-	-	1	-
CO3	-	2	-	-	-	-	-	-	3	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	1	-	-	2	-
CO5	1	-	-	2	-	-	-	-	-	-	-	-	1	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/ Associate Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CE304 ENGINEERING GEOLOGY Category:PCC

SDG:4,9

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1.At the end of this course the students will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbour as well as to choose types of foundations

UNIT 1 PHYSICALGEOLOGY 9

Geology in civil engineering – branches of geology – structure of earth and its composition – weathering of rocks–scale of weathering–soils-landforms and processes associated with river, wind, ground water and sea–relevance to civil engineering. Plate tectonics–Earthquakes–Seismic zones in India.

UNIT 2 MINERALOGY 9

Physical properties of minerals–Quartz group, Feldspar group, Pyroxene- hypersthene and augite, Amphibole – hornblende, Mica – muscovite and biotite, Calcite, Gypsumand Clayminerals.

UNIT 3 PETROLOGY 9

Classification of rocks, distinction between Igneous, Sedimentary andMetamorphic rocks.Engineering properties of rocks. Description, occurrence, engineering properties, distribution and uses of Granite, Dolerite,Basalt, Sandstone,Limestone,Laterite, Shale, Quartzite, Marble,Slate, Gneiss and Schist.

UNIT 4 STRUCTURAL GEOLOGY ANDGEOPHYSICALMETHODS 9

Geological maps–attitude of beds, study of faults and joints–relevance to civil engineering. Geophysical methods– Seismic and electrical methods for subsurface investigations.

UNIT 5 APPLICATION OF GEOLOGICAL INVESTIGATIONS 9

Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs,Tunnels,and Road cuttings–Hydrogeological investigations and mining- Coastal protection structures.Investigation of Landslides, causes and mitigation

COURSE OUTCOMES:

At the end ofthe course,students would

CO1: The students can able to understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies.

CO2: Will get basics knowledgeon properties ofminerals.

CO3: Gain knowledge about types of rocks, their distribution and uses.

CO4: Will understand the methods of study on geological structure.

CO5: Will understand the application of geological investigation in projects such as dams,tunnels, bridges,roads, airport and harbour.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Varghese,P.C.,Engineering Geology for Civil Engineering Prentice Hall of India Learning Private Limited, NewDelhi, 2012.
2. Venkat Reddy. D. Engineering Geology, Vikas Publishing House Pvt. Lt, 2010.
3. GokhaleKVGK,"Principles ofEngineering Geology", B.S. Publications, Hyderabad 2011.

REFERENCES:

1. Blyth F.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London, 2010.
2.Bell .F.G. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.
3. Dobrin, M.B "An introduction to geophysical prospecting", McGraw Hill, New Delhi, 1988

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	-	-	-	-	-	-	1	-	2	-	-	3	-	1	1
CO2	-	-	-	-	-	-	2	-	3	-	-	2	-	1	1
CO3	-	-	-	-	-	-	2	-	3	2	-	3	-	1	1
CO4	-	-	-	-	-	-	2	-	2	1	-	2	-	1	2
CO5	-	-	-	-	-	-	2	-	3	2	-	3	-	1	2
Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation															

COURSE DESIGNED BY	APPROVED BY
Mr.S.Sukumar / Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE305 CONSTRUCTION MATERIALS AND TECHNOLOGY PCC

SDG: 9

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. To introduce students to various construction materials that is commonly used in civil engineering construction.
2. To knowledge in modern and smart materials of construction.
3. To understand about types of foundations, types of masonry, construction practices and service requirements.
4. To learn about the various construction equipment.
5. To understand in the construction planning and scheduling

UNIT 1 INTRODUCTION 9

Basic construction materials-Stone as building material – Criteria for selection – Tests on stones – Bricks – Classificati bricks – Tests on bricks – Compressive strength – Water Absorption – Efflorescence – Lime – Preparation of lime mortar Lightweight concrete blocks

UNIT 2 MODERN MATERIALS OF CONSTRUCTION 9

Glass – Ceramics – Refractories – Composite Materials – Types and applications of laminar composites – FRP – Fibre textiles – Geomembranes and Geotextiles for earth reinforcement - Smart materials

UNIT 3 CONSTRUCTION PRACTICES & SERVICE REQUIREMENTS 9

Types of Foundations – Shallow and Deep Foundations – Stone Masonry – Brick Masonry – Plastering and Pointing – Cavity Walls – Diaphragm Walls – Formwork – Centering and Shuttering – Shoring – Scaffolding – Underpinning – Roofing – Flooring – Joints in concrete – Contraction/Construction/Expansion joints – Fire Protection – Thermal Insulation – Ventilation and Air conditioning – Acoustics and Sound Insulation – Damp Proofing.

UNIT 4 CONSTRUCTION EQUIPMENTS 9

Selection of equipment for earthwork – earth moving operations – types of earthwork equipment – Equipment for foundation and pile driving. Equipment for compaction, batching and concreting, material handling and erection of structures – Types of cranes - Equipment for dredging, trenching and tunneling.

UNIT 5 CONSTRUCTION PLANNING 9

Introduction to construction planning – Scheduling for activities – Critical path method (CPM) and PERT network modeling and time analysis – Case illustrations.

TOTAL = 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Compare the properties of most common and advanced building materials.

CO2: Understand the importance of modern materials for construction.

CO3: Identify the best construction and services practices such as thermal insulations and air conditioning of the buildings.

CO4: Select various equipment for construction work conditioning of building.

CO5: Understand the construction planning and scheduling techniques.

TEXT BOOKS:

1. Varghese.P.C, Building Materials, Second Edition PHI Learning Ltd., 2015. .
2. Arora S.P and Bindra S.P Building construction, Dhanpat Rai and sons, 2013.
3. Building construction—B.C.Punmia; Ashok Kumar Jain; Arun Kumar Jain, Firewall Media, 2005
4. Building Construction- P.C.Varghese, PHI Learning Pvt. Ltd.2009

REFERENCE BOOKS:

1. Varghese.P.C, Building Construction, Second Edition PHI Learning ltd., 2016.
2. Punmia ,B.C Building construction , Laxmi publication (p)ltd..,2008.
3. Peurifoy R.L., Schexnayder,C.J., Shapira A., Schmitt.R., Construction Planning Equipment and Methods, Tata McGraw-hill, 2011.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	3	-	2	2	-	-	-	-	2	3	-	-
CO2	3	-	-	3	-	-	2	-	-	-	-	2	3	-	2
CO3	3	-	-	2	-	-	3	-	-	-	2	-	3	-	2
CO4	2	-	-	-	-	-	-	-	-	-	2	-	3	3	-
CO5	2	3	2	3	2	2	-	-	2	-	3	2	3	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

4. Srinath L.S.,PERT and CPM -Principles and applications, Affliated East West Press 2001

COURSE DESIGNED BY	APPROVED BY
Mr.S.Sukumar / Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE311 **SURVEYING LABORATORY** **Category: PCC**

SDG: 15

L	T	P	C
0	0	4	2

COURSE OBJECTIVE:

1. To enhance the ability to measure different surveying measurements.
2. To enable the handling of various surveying equipments.
3. To apply suitable surveying methods and instruments for a given problem.
4. To understand the advanced surveying techniques.
5. To enable the handling of advanced surveying equipments.

LIST OF EXPEERIMENTS:

. **CHAIN SURVEY**

i) Study of chains and its accessories, aligning, ranging, chaining and marking perpendicular offset.

ii) Setting out works – Foundation marking for single and double room using tapes and chain.

2. **TRAVERSING**

i) Compass Traversing – Measuring Bearings and Arriving included angles.
ii) Plane Table Traversing – Intersection method.

iii) Plane Table Traversing – Two point problem.
iv) Plane Table Traversing – Three point proble

3. **LEVELLING**

i) Fly levelling using dumpy level.

4. **THEODOLITE**

i) Measurements of horizontal angles by reiteration and repetition method.
ii) Measurements of vertical angles.

5. **TOTAL STATION**

i) Study of Total Station.

ii) Traversing using Total station and Area of Traverse

6. To plot the contour map for a given area by direct method.

6. Setting out a Building.

COURSE OUTCOMES:

At the end of the course, students would

CO1: The student will be able to handle the surveying instruments like Chain, Compass, Plane table and Dumpy level.
CO2: The Student will be able to measure distances and angles using Theodolite.
CO3: The Student will be able to conduct field survey and collect data.
CO4: The student will be able to do measurements precisely using advanced surveying instruments.
CO5: The student will be able to handle the advanced surveying instruments like total station and GPS.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3
CO1	3	2	1	1	-	-	-	-	2	-	-	-	1	-	-
CO2	1	-	-	2	-	-	-	-	-	2	-	-	-	1	-
CO3	-	2	1	-	-	-	-	-	2	2	-	-	-	-	1
CO4	2	3	-	-	-	-	-	-	-	2	2	-	-	2	-
CO5	1	-	-	2	-	-	-	-	-	-	-	-	1	-	1

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/ Associate Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

MATERIAL TESTING LABORATORY **Category : PCC**

U23CE312

SDG:4,9,11

L	T	P	C
3	0	4	2

COURSE OBJECTIVE:

1.To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

2. To develop skills to test various construction materials

LIST OF EXPEERIMENTS

1 TESTS ON METALS

iii) Tension test on steel rod.

iv) Torsion test on mild steel rod. v) Deflection test on metal beam. vi) Double shear test on metal.

vii) Impact test on metal specimen (Izod and Charpy).

viii) Hardness test on metals (Rockwell and Brinell Hardness Tests). ix) Compression test on helical spring.

x) Deflection test on carriage spring.

2 TESTS ON CEMENT

v) Determination of fineness of cement.

vi) Determination of consistency of cement.

vii) Determination of specific gravity of cement.

viii) Determination of initial and final setting time of cement.

3 TESTS ON FINE AGGREGATE

ii) Determination of specific gravity and water absorption of fine aggregate. iii) Determination of grading of fine aggregate.

iv) Determination of water absorption for fine aggregate.

4 **TESTS ON COARSE AGGREGATE**

iii) Determination of compacted and loose bulk density of coarse aggregate. iv) Determination of impact value of coarse aggregate.

v) Determination of elongation index of coarse aggregate.

vi) Determination of flakiness index of coarse aggregate.

vii) Determination of aggregate crushing value of coarse aggregate.

viii) Determination of specific gravity and water absorption of coarse aggregate.

5 TESTS ON BRICKS

iii) Determination of compressive strength of bricks. iv) Determination of water absorption of bricks.

v) Determination of efflorescenceof bricks.

6 TEST ON WOOD

i) Determination of Compression test on wood.

TOTAL: 45 PERIODS

At the end of the course, students would

CO1: Determine the mechanical properties of steel.

CO2: Determine the mechanical properties of Cement.

CO3: Determine the physical properties of fine aggregate.

CO4: Determine the physical properties of coarse aggregate.

CO5: Determine the strength of brick and wood

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3
CO1	1	2	-	2	-	2	-	-	3	-	-	3	1	1	1
CO2	1	2	-	2	-	2	-	-	3	-	-	2	1	1	1
CO3	1	2	-	2	-	2	-	-	3	-	-	3	1	1	1
CO4	1	2	-	2	-	2	-	-	3	-	-	3	1	1	2
CO5	1	2	-	2	-	2	-	-	3	-	-	3	1	1	2

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23EE203 EMPLOYABILITY SKILL I Category: EEC

SDG: 4

APTITUDE AND COMMUNICATION FOR ENGINEERS I

L	T	P	C
0	0	2	1*

COURSE OBJECTIVE:

1. Learn basic concepts of Learning Expectations and communication.

2. Gain the knowledge of speaking skills and importance of English.

3. Understand the basic concepts in speech craft and debate.

4. Adopt the tenses and passage writing.

5. Develop the aptitude for placements

UNIT 1 INTRODUCTION & ORIENTATION 3

Introduction about the Course - Learning expectations - Communication pre-assessment

UNIT 2 SPEAKING SKILLS – NOVICE 9

Communication skills –overcoming barriers and inhibitions - Importance of English - Challenges faced in English communication - Developing a globally comprehensible accent -Speech Craft- Public Speaking – Squabble.

UNIT 3 SPEAKING SKILLS - INTERMEDIATE 3

Speech Craft –for and against – Debate (Ship Wreck Activity)

UNIT 4 LANGUAGE GYM – I 6

Tenses for various communication scenarios – Common errors in daily communication – Thought Group reading – Passage writing.

UNIT 5 APTITUDE FOR PLACEMENTS- 1 9

Placement Paper 1 – HCF & LCM, Problems on Numbers-Placement Paper 2 – Average, Simplification – Placement Paper 3-Percentage, Simple & compound Interest - Placement Paper 4 – Time & Distance – Placement Paper 5-Trains & Boats, Placement Paper 6 – Time & Work, Pipes & Cistern

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-	2	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-	2	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

SEMESTER IV

U23CE402 **STRENGTH OF MATERIALS II** **L T P C**

SDG:9 3 0 0 3

COURSE OBJECTIVE :

1.To know the method of finding slope and deflection of beams and trusses using energy theorems and to know the concept of analysing indeterminate beam.

2.To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.

UNIT 1 **ENERGY PRINCIPLES** **9**

Strain energy and strain energy density – strain energy due to axial load (gradual, sudden and impact loadings) , shear, flexure and torsion – Castigliano's theorems – Maxwell's reciprocal theorem - Principle of virtual work – unit load method - Application of energy theorems for computing deflections in determinate beams , plane frames and plane trusses – lack of fit and temperature effects - Williot Mohr's Diagram.

UNIT 2 **INDETERMINATE BEAMS** **9**

Concept of Analysis - Propped cantilever and fixed beams - fixed end moments and reactions – sinking and rotation of supports - Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

UNIT 3 **COLUMNS AND CYLINDERS** **9**

Euler's column theory – critical load for prismatic columns with different end conditions – Effective length – limitations - Rankine-Gordon formula - Eccentrically loaded columns – middle third rule - core of a section – Thin cylindrical and spherical shells – stresses and change in dimensions - Thick cylinders – Compound cylinders – shrinking on stresses

UNIT 4 **STATE OF STRESS IN THREE DIMENSIONS** **9**

Stress tensor at a point – Stress invariants - Determination of principal stresses and principal planes - Volumetric strain. Theories of failure: Maximum Principal stress theory – Maximum

Principal strain theory – Maximum shear stress theory – Total Strain energy theory – Maximum distortion energy theory – Application problems.

UNIT 5 ADVANCED TOPICS 9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - curved beams – Winkler Bach formula – stresses in hooks..

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1: The students can able to determine the strain energy and compute the deflection of determinate beams, frames and trusses using energy principles

CO2: Analyze propped cantilever, fixed beams and continuous beams using theorem of three moment equation for external loadings and support settlements.

CO3: Find the load carrying capacity of columns and stresses induced in columns and cylinders.

CO4: Determine principal stresses and planes for an element in three dimensional state of stress and study various theories of failure.

CO5: Determine the stresses due to Unsymmetrical bending of beams, locate the shear centre, and find the stresses in curved beams.

TEXT BOOKS:

1.Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2015.

2. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011

3. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol - II, Laxmi Publishing Pvt Ltd, New Delhi 2017.

4. Basavarajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2016.

REFERENCES:

1. Kazimi S.M.A, “Solid Mechanics”, Tata McGraw-Hill Publishing Co., New Delhi, 2003

2. William A .Nash, “Theory and Problems of Strength of Materials”, Schaum’s Outline Series, Tata McGraw Hill Publishing company, 2007

3. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2016.

4. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012

CO's-PO's&PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	1	3	3	2	2	-	1	1	2	1	3	2	3
CO2	1	-	-	2	2	2	3	-	1	1	2	1	2	3	2
CO3	2	3	3	2	3	3	2	1	2	2	2	1	3	3	3
CO4	2	3	3	3	2	1	2	1	1	1	2	1	3	3	3
CO5	1	3	3	3	2	2	1	1	2	2	3	2	2	3	2	3

Correlationlevels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CE402 APPLIED HYDRAULICS ENGINEERING **Category : ESC**

SDG:

L	T	P	C
2	0	0	2

COURSE OBJECTIVE:

1. To impart basic knowledge to the students about the open channel flows with analysis of uniform flow, gradually varied flow and rapidly varied flow and to expose them to basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan Centrifugal turbine, and Reciprocating.
2. To impart basic knowledge to the students about the open channel flows with analysis of uniform flow, gradually varied flow and rapidly varied flow
3. To basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine, Centrifugal and Reciprocating pumps.
4. To develop the ability to apply fluid mechanics principles to the design and operation of hydraulic machinery and flow systems used in engineering applications.

5. To familiarize students with performance evaluation, selection, and maintenance of hydraulic equipment in sustainable water resource engineering

UNIT 1 VARIED FLOW AND RAPIDLY VARIED FLOW 9

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Sub-critical, Super-critical and Critical flow - Velocity distribution in open channel - Steady uniform flow.

UNIT 2 VARIED FLOW AND RAPIDLY VARIED FLOW 9

Dynamic equations of gradually varied - Water surface flow profile classifications: Hydraulic Slope, Hydraulic Curve - Profile determination by Numerical method: Direct step method and Standard step method- Application of the momentum equation for RVF - Hydraulic jumps

UNIT 3 TURBINES 9

Turbines - Classification - Impulse turbine – Pelton wheel - Reaction turbines - Francis turbine - Kaplan turbine - Draft tube - Cavitation - Performance of turbine - Specific speed.

UNIT 4 PUMPS 9

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitations' in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps.

UNIT 5 INTRODUCTION TO WATER RESOURCE SYSTEM 9

Hydrological cycle-precipitation-types of precipitation-Infiltration-reservoirs-Droughts-floods-rainfall-rainguage-types of rain gauges

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Describe the basics of open channel flow, its classification and analysis of uniform flow in steady state conditions with specific energy concept and its application

CO2: Analyse steady gradually varied flow, water surface profiles and its length calculation using direct and standard step methods with change in water surface profiles due to change in grades.

CO3: Derive the relationship among the sequent depths of steady rapidly varied flow and estimating energy loss in hydraulic jump with exposure to positive and negative surges

CO4: Design turbine and explain the working principle of pumps

CO5: Differentiate pumps and explain the working principle with characteristic curves and design centrifugal and reciprocating pumps

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jain. A.K., Fluid Mechanics, Khanna Publishers, Delhi,2010.
2. Chandramouli P N, Applied Hydraulic Engineering, Yes Dee Publisher, 2017

REFERENCES*:*

1. Ven Te Chow, Open Channel Hydraulics, McGraw Hill, New York, 2009.
2. Mays L.W.,Water Resources Engineering, JohnWiley and Sons (WSE), New York, 2019
3. Subramanya K., Flow in open channels, Tata McGraw Hill, New Delhi, 2019.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	1	-	1	-	-	1	-	-	1	1	1	2	2	2
CO2	3	3	2	3	-	-	1	-	-	1	1	1	2	2	2
CO3	3	2	1	2	-	-	1	-	-	1	1	1	1	1	2
CO4	3	2	1	3	2	-	1	-	-	1	1	1	2	2	1
CO5	3	2	2	2	3	-	1	-	-	1	1	1	2	2	2

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

Category:PCC

U23CE403 SURVEYING II L T P C

SDG:9 3 0 0 3

COURSE OBJECTIVE :

1.To learn about the advanced methods of surveying to solve complex civil engineering problems
2.To understand the principles and concepts of control surveying using instruments.
3.To learn about errors in field measurements and their adjustments..
4.To understand the principles and concepts of Hydrographic Survey.
5.To understand the principles and concepts of advanced surveying instruments.

UNIT 1 TACHEOMETRIC SURVEYING 9

Tacheometric Systems-Tangential, Stadia and Subtence Methods-Stadia Systems- Fixed and Movable Hairs-Stadia Constants - Horizontal and Inclined Line of Sights-Vertical and Normal Staffing-Tangential Tacheometry - Anallactic Lens

UNIT 2 CONTROL SURVEYING 9

Vertical and Horizontal Control-Triangulation-Classification – Intervisibility - Triangulation Figures – Strength of Figure - Signals and Towers - Base Line Measurements - Satellite Stations and Reduction to Centre - Trignometric Leveling – Geodetic Observations – Difference in Elevation - Single and Reciprocal Observations.

UNIT 3 SURVEY ADJUSTMENTS 9

Definitions - Errors- Types - Sources, Precautions and Corrections- True and Most Probable Values - Laws of Weights - Principle of Least Squares- Determination of Most Probable Values - Normal Equations Method – Method of Differences - Method of Correlates – Adjustment of Plane and Spherical Triangle.

UNIT 4 HYDROGRAPHIC SURVEYING 9

Shore Line Survey – Tides – Tide Gauges – Types – Sounding – Equipments – Locating Sounding - Reduction- Route Survey – Reconnaissance, Preliminary, Location and Construction Survey.

UNIT 5 MODERN SURVEYING INSTRUMENTS 9

Digital Level - Electromagnetic Distance Measurement - Electromagnetic Waves – Principle – Types of Edm Instruments – Total Station – Parts – Accessories – Field Procedure – Errors – Office Work – GPS – Development – Basic Concepts – Segments - Receivers and Methods - Applications – GIS – Components - Data Models – Data Acquisition – Maps and Map Projection

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:
CO1:The students will possess knowledge about tachometric surveying and control surveying.
CO2: Able to do survey adjustments in the field measurements
CO3: The student will be able to interpret survey data and calculate surveying quantities.

CO4: The student will be able to know about hydrographic surveying.
CO5: The student will gain knowledge on modern surveying instruments.

TEXT BOOKS

1.Kanetkar .T.P, and Kulkarni .S.V, "Surveying and Levelling, Vol. I & II", Pune Vidyarthi Griha Prakashan ,2004.

2.Duggal S.K ."Surveying ,Vol. I & II", Tata McGraw-Hill, Publishing Company, 2004.

3.Basak N.N, "Surveying and Leveling", Tata McGraw-Hill, Publishing Company, 2014.

4.Bhavikatti S.S, "Surveying and Leveling , Vol.I& II", I.K. International Pvt. Ltd., 2010.

REFERENCE BOOKS

1.Charles D Ghilani, Paul R Wolf., Elementary Surveying, Prentice Hall, 2012.
Bannister. A & Reynolds. S, "Surveying", ELBS, 1992.
2.Chandra A.M., "Plane Surveying", New Age International Pvt. Ltd, 2015.

CO's-PO's&PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	-	-	1	2	-	-	-	-	2	1	-	-	-	-	-
CO2	3	-	-	1	-	-	-	-	1	-	-	-	-	1	-
CO3	-	-	-	2	-	-	-	-	3	1	-	-	-	2	-
CO4	2	-	1	-	-	-	-	-	-	-	2	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	2	-	-	1	2	-

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/Associate Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category:PCC

U23CE404	**SOIL MECHANICS**	**L**	**T**	**P**	**C**
SDG:9		3	0	0	3

COURSE OBJECTIVE :

1.To provide an exposure to the concept of three phase system and soil properties. Classify the soil, understand its behaviour and will be able to compute/estimate index parameters.
2.To learn the role of water in soil behaviour and its applications in soil stresses, permeability and seepage.
3.To explain the volume-change behaviour in soil through Compaction and consolidation and estimating consolidation settlement.
4.To develop the knowledge in Stress distribution and Settlement in soil.
5.To understand the concept of shear strength of soil through various shear test and to learn Slope stability concepts.

UNIT 1 SOIL CLASSIFICATION AND COMPACTION 9

Formation of soil - Soil description – Particle – Size shape and colour – Composition of gravel, sand, silt, clay particles – Particle behaviour – Soil structure – Phase relationship – Index properties – Significance – BIS classification system – Unified classification system – Compaction of soils – Theory, Laboratory and field tests – Field Compaction methods – Factors influencing compaction of soils

UNIT 2 EFFECTIVE STRESS AND PERMEABILITY 9

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena– Darcy's law – Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils – Seepage - Two dimensional flow – Laplace's equation – Introduction to flow nets

UNIT 3 STRESS DISTRIBUTION AND SETTLEMENT 9

Stress distribution in homogeneous and isotropic medium – Boussinesq theory – (Point land, Line land and udl.) - Use of New marks influence chart –Components of settlement — Immediate and consolidation settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. - √t and log t methods– e-log p relationship

UNIT 4 SHEAR STRENGTH 9

Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – Measurement of shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters

UNIT 5 SLOPE STABILITY 9

Stability Analysis - Infinite slopes and finite slopes – Total stress analysis for saturated clay – Friction circle method – Use of stability number – Method of slices – Fellenious and Bishop's method - Slope protection measures.

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1:Demonstrate an ability to identify various types of soils and its properties, formulate and solve engineering Problems

CO2:Show the basic understanding of flow through soil medium and its impact of engineering solution

CO3:Understand the basic concept of stress distribution in loaded soil medium and soil settlement due to consolidation

CO4:Show the understanding of shear strength of soils and its impact of engineering solutions to the loaded soil medium and also will be aware of contemporary issues on shear strength of soils

CO5:Demonstrate an ability to design both finite and infinite slopes, component and process as per needs and specifications

TEXT BOOKS

1.Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2015
2.Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016
3.Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2017.

REFERENCE BOOKS

1.McCarthy, D.F., "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2006.

2.Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt.Ltd. New Delhi, 2010.

3.Das, B.M., "Principles of Geotechnical Engineering". Brooks / Coles / Thompson Learning Singapore, 8th Edition, 2013.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	3	2	2	3	1	1	1	2	1	2	3	3	3	2
CO2	3	2	3	2	3	1	1	1	2	1	2	3	2	2	3
CO3	3	3	2	2	2	2	1	1	2	1	2	3	2	2	3
CO4	2	3	3	2	2	1	1	1	1	1	2	3	2	2	3
CO5	3	3	2	2	2	1	1	1	1	1	1	3	2	3	2

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.JK Sowmiya/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

SDG:

L	T	P	C
2	0	0	2

COURSE OBJECTIVE:

1. To study the properties of concrete making materials.
2. To have better knowledge about the chemical and mineral admixtures in concrete.
3. To familiarize with the IS method of mix design as per the latest code.
4. To understand the fresh and hardened properties of concrete.
5. To know the importance and applications of special concretes

UNIT 1 CONSTITUENT MATERIALS 9

Cement-Different types-Chemical composition and Properties -Tests on cement-IS Specifications- Aggregates-Classification-Mechanical properties and tests as per BIS Grading requirements-Water- Quality of water for use in concrete.

UNIT 2 CHEMICAL AND MINERAL ADMIXTURES 9

Accelerators-Retarders- Plasticizers- Super plasticizers-Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline -Their effects on concrete properties

UNIT 3 PROPORTIONING OF CONCRETE MIX 9

Principles of Mix Proportioning-Properties of concrete related to Mix Design-Physical properties of materials required for Mix Design - Design Mix and Nominal Mix-BIS Method of Mix Design - Mix Design Examples

UNIT 4 FRESH AND HARDENED PROPERTIES OF CONCRETE 9

Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete-Stress-strain curve for concrete-Determination of Modulus of elasticity.

UNIT 5 SPECIAL CONCRETES 9

Light weight concretes - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete - SIFCON - Shotcrete – Polymer concrete - High performance concrete- self compacting concrete - Geopolymer Concrete.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Understand the requirements of cement, aggregates and water for concrete

CO2: Select suitable admixtures for enhancing the properties of concrete

CO3: Design concrete mixes as per IS method of mix design

CO4: Determine the properties of concrete at fresh and hardened state.

CO5: Determine the properties of concrete at fresh and hardened state.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
2. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003

REFERENCES:

1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London,1995
2. Gambhir.M.L.Concrete Technology,Fifth Edition, McGraw Hill Education,2017.
3. Job Thomas., Concrete Technology, Cencage learning India Private Ltd, New Delhi, 2015.
4. IS10262-2019 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	1	1	2	1	3	3	2	1	1	1	2	3	2	3
CO2	3	1	1	1	1	3	3	1	1	1	1	2	3	2	3
CO3	3	2	3	3	1	3	3	1	1	1	1	2	3	2	3
CO4	3	1	1	1	1	3	3	2	1	1	2	2	3	2	3
CO5	3	1	1	1	1	3	3	2	1	1	1	2	3	2	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.S.Brindha/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category:PEC

U23CY402	**ENVIRONMENTAL ECOSYSTEM AND SUSTAINABILITY**	**L T P C**
SDG:9		2 0 0 2

COURSE OBJECTIVE :

1. Study the interrelationship between living organism and environment
2. Assess the environmental pollution and its impact
3. Understand the significance of natural resources and their conservation
4. Identify and implement scientific, economic and political solutions to environmental problems.
5. Understand the influence of human population on environmental issues and role of information technology as a tool to minimize the environmental problems.

UNIT 1 ECOSYSTEMS AND BIODIVERSITY 9

Definition, Scope and importance of environment - Concept of an ecosystem - Structure and function of an ecosystem (Grassland and River ecosystem only) - Food chains, Food webs and ecological pyramids - Introduction to biodiversity- Definition- Genetic, Species and ecosystem diversity - Value of biodiversity - Threats to biodiversity- Conservation of biodiversity. Case study of simple ecosystems -pond, river, hill slopes, etc..

UNIT 2 ENVIRONMENTAL POLLUTION 9

Definition - Causes, Effects and control measures of (a) Air pollution (b) Water pollution (c) Thermal pollution - Solid waste management: Causes, Effects and control measures of municipal solid wastes - Role of an individual in prevention of pollution - Pollution case studies -Disaster management - Floods, Earthquake, Cyclone and landslides. Case study of local polluted site - Urban / Rural / Industrial / Agricultural

UNIT 3 NATURAL RESOURCES 9

Forest resources - Use and over-exploitation, Deforestation - Water resources - Use and over-utilization of surface and ground water, Drought, Conflicts over water, dams-Benefits and problems - Food resources- Changes caused by agriculture and overgrazing, Effects of modern agriculture, Fertilizer-pesticide problems, water logging, Salinity-Role of an individual in conservation of natural resources (National and International level).

UNIT 4 SOCIAL ISSUES AND THE ENVIRONMENT 9

Unsustainable to sustainable development-Water conservation, Rain water harvesting, Watershed management - Resettlement and rehabilitation of people - its problems and concerns –Carbon credit, Carbon footprint, Climate change, Global warming, Acid rain, Ozone layer depletion - Environment protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and Control of Pollution) Act., Consumerism and Consumerism act.

UNIT 5 HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth, Variation among nations -Population explosion - Family welfare programme - Environment and human health -Value education - Pandemic issues and management-Women and child welfare - Role of information technology in environment and human health - Case studies.

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1: The students will able to understand the basis of ecological principles and environmental regulations which in turn helps in sustainable development and human population and environment. Use and over exploitation of forest and water and food resources

CO2: The students will able to understand various schemes for the protection of species, role of an individual in prevention of pollution and conservation of natural resources.

CO3: The students will able to understand design of pollution control structures, resettlement and rehabilitation of people, welfare about the women and child.

CO4: The students will able to apply enough knowledge of implement various Environmental ethics, regulations and schemes, Pandemic issues and management, dams-benefits and problems, conservation of biodiversity..

CO5: The students will able to analyze the disaster management – floods, earthquake, cyclone and landslides. Water logging, salinity, climate change, global warming, acid rain and ozone layer depletion.

TEXT BOOKS:

1. Benny Joseph, “Environmental Science and Engineering”, Tata McGrawHill, New Delhi, 2017

2. Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, 2nd Edition, Pearson Education, 2016.

3. George Tchobanoglous, Frank Kreith, “Handbook of Solid Waste Management” (McGrawHill Handbooks), McGraw-Hill Education, 2ndEdition July 2017.

REFERENCES:

1. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media. 2015.

2. ErachBharucha, "Textbook of Environmental Studies", Universities Press (I) Private Limited, Hydrabad, 2015.

3. Rajagopalan R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

CO's-PO's&PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PS O1	PS O2	PS O3
CO1	3	1	1	1	-	-	1	-	1	1	-	1			
CO2	3	1	1	1	-	-	1	-	1	1	-	1			
CO3	3	1	1	1	-	-	1	-	1	1	-	1			
CO4	3	1	1	1	-	-	1	-	1	1	-	1			
CO5	3	1	1	1	-	-	1	-	1	1	-	1			

Correlationlevels 1– low 2– medium 3 – high "-"-no correlation :

COURSE DESIGNED BY	APPROVED BY
/Assistant Professor Department of Civil Engineering	
Name and Department	Name and Department of BoS Chairman

Category:PCC

U23CE411 HYDRAULIC ENGINEERING LABORATORY

SDG:9

L T P C

0 0 3 2

COURSE OBJECTIVE :

To provide hands on experience in calibration of flow meters, performance characteristics of pumps and turbines.

LIST OF EXPERIMENTS:

I. FLOW MEASUREMENT

Sl.No	Experiment
1.	Calibration of Rotameter
2.	Flow through Orifice meter/mouthpiece,Venturimeter and Notches
3.	Bernoulli's Experiment

II. LOSSES IN PIPES

Sl.No	Experiment
4.	Determination of friction factor in pipes.
5.	Determination of minor losses.

III. PUMPS

Sl.No	Experiment
6.	Characteristics of Centrifugal pumps
7.	Characteristics of Gear pump
8.	Characteristics of Submersible pump
9.	Characteristics of Reciprocating pump

IV. TURBINES

Sl.No	Experiment
10.	Characteristics of Pelton wheel turbine
11.	Characteristics of Francis turbine

V. DETERMINATION OF METACENTRIC HEIGHT

Sl.No	Experiment
12.	Determination of met centric height of floating bodies.

TOTAL : 45 PERIODS

COURSE OUTCOMES

CO1:Apply Bernoulli equation for calibration of flow measuring devices
CO2: Measure friction factor in pipes and compare with Moody diagram
CO3: Determine the performance characteristics of roto dynamic pumps.
CO4: Determine the performance characteristics of positive displacement pumps
CO5: Determine the performance characteristics of turbines

CO's-PO's&PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	3	3	1	1	1	1	3	1	1	3	3	3	3
CO2	1	2	3	3	1	1	1	1	3	2	1	3	2	3	2
CO3	3	3	3	3	1	1	1	1	3	1	1	3	2	3	3

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CE412 **SOIL MECHANICS LABORATORY** **L T P C**

SDG:9 **0 0 3 2**

COURSE OBJECTIVE :

To develop skills to test the soils for their index and engineering properties and to characterize the soil based on their properties.

LIST OF EXPERIMENTS

I.DETERMINATION OF INDEX PROPERTIES

Sl.No	**Experiment**
1.	Specific gravity of soil solids
2.	Grain size distribution – Sieve analysis
3.	Grain size distribution - Hydrometer analysis
4.	Liquid limit and Plastic limit tests
5.	Shrinkage limit and Differential free swell tests

II.DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS

Sl.No	**Experiment**
6.	Field density Test (Sand replacement and Core cutter method)
7.	Determination of moisture – density relationship using standard proctor compaction test.

III.DETERMINATION OF ENGINEERING PROPERTIES

Sl.No	**Experiment**
8.	Permeability determination (constant head and falling head methods)
9.	One dimensional consolidation test (Determination of Co-efficient of consolidation only)compaction test.
10.	Direct shear test in cohesionless soil
11.	Unconfined compression test in cohesive soil

12.	Laboratory vane shear test in cohesive soil
13.	Tri-axial compression test in cohesionless soil (Demonstration only)
14.	California Bearing Ratio Test

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1:Conduct tests to determine the index properties of soils.
CO2:Determine the in situ density and compaction characteristics.
CO3:Conduct tests to determine the compressibility, permeability and shear strength of soils.

REFERENCE BOOKS

1.Soil Engineering Laboratory Instruction Manual" published by Engineering College Co- operative Society, Anna University, Chennai, 2010.
2."Saibaba Reddy, E. Ramasastri, K. "Measurement of Engineering Properties of Soils", New age International (P) limited publishers, New Delhi, 2008.
3.Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1951. Digitized 2008

CO's-PO's&PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	3	2	2	3	1	1	1	2	1	2	3	3	3	2
CO2	3	2	3	2	3	1	1	1	2	1	2	3	2	2	3
CO3	3	3	2	2	2	2	1	1	2	1	2	3	2	2	3
CO4	2	3	3	2	2	1	1	1	1	1	2	3	2	2	3
CO5	3	3	2	2	2	1	1	1	1	1	1	3	2	3	2

Correlationlevels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.JK Sowmiya/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category:PEC

U23CE413 CONCRETE TECHNOLOGY LABORATORY L T P C

SDG:9 0 0 3 2

COURSE OBJECTIVE :

1. To learn the principles and procedures of testing Concrete material through various test..

LIST OF EXPERIMENTS:

Grading of Fine Aggregate

1. Crushing Value of Coarse Aggregate
2. Slump Cone Test
3. Flow Table Test
4. Compaction Factor
5. Vee-Bee Test
6. Compressive Strength test of Concrete
7. Split Tensile Strength test of Concrete
8. Flexure Strength test of Concrete
9. Determination of flowability of self-compacting concrete (Demo only)

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1: Determine the quality of aggregate

CO2: Understand various test on concrete

CO3: Determine the workability and compressive strength of concrete

CO's-PO's&PSO's MAPPING															
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	2	2	3	3	1	1	1	1	3	1	1	3	3	3	3
CO2	1	2	3	3	1	1	1	1	3	2	1	3	2	3	2
CO3	3	3	3	3	1	1	1	1	3	1	1	3	2	3	3
Correlation levels: 1– low 2– medium 3 – high "-"-no correlation															

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23EE414 **Aptitude and Communication for Engineers II (Common to all Branches)** **Category : BSC**

SDG: 4

L	T	P	C
1	0	1	1

COURSE OBJECTIVE:

1. To enhance the students' ability to contribute effectively and confidently in classroom and other forums and thereby they can exhibit their skills and gain attention.
2. To further enhance and improve their communicative English for industry readiness through various speech craft activities.
3. To take a stock of internal strength and weakness and prepare a plan to manage external threats and opportunities

4. To get ready to kick start their career journey by assessing their current skills and talents.
5. To train students on clearing various placement papers with greater accuracy

UNIT 1	**Course Introduction**	**2**

Introduction about the Course - Learning expectations

UNIT 2	**Speaking Skills -Vantage**	**12**

Speech Craft –My buddy - Impromptu

UNIT 3	**Personality Development**	**3**

Psychometric Assessments - SWOT analysis

UNIT 4	**Placement Readiness**	**4**

Placement inventory-– Resume - Grooming

UNIT 5	**Aptitude for Placements - II**	**9**

Placement Paper 7–Permutation & Combination – Probability, Placement Paper 8 – Arithmetic Reasoning – Problems on Ages, Placement Paper 9 – Ratio Proportion & Alligation Mixture, Placement Paper 10 – Clocks & Calendars.

COURSE OUTCOMES:

Upon completion of this course,

CO1: Students will be able to participate in any learning activity without any reservations. They shall be ready to move beyond their comfort zone to acquire new skills throughout their life.

CO2: Students shall understand and appreciate the importance of English in the current global scenario and make efforts towards up skilling the same.

CO3: They must be able to identify their strength and enhance the same.

CO4: They shall prepare themselves to kick start their career by taking a stock of their existing skills and plan to acquire new skills required to achieve their goals.

CO5: They shall demonstrate a good understanding of basic mathematical concepts required to learn engineering. To use appropriate strategies and shortcuts to improve speed and accuracy in solving aptitude problems during recruitment processes

TOTAL: 30 PERIODS

TEXT BOOKS:

1. The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Dinesh Khattar. Pearson
2. Quantitative Aptitude Dr. R.S. Aggarwal S. Chand Publication
3. A modern Approach to Verbal and Non-Verbal Reasoning R.S. Aggarwal
4. A Modern Approach to Verbal & Non-Verbal Reasoning - Aggarwal R. S

REFERENCES:

1. Quantitative Aptitude for CAT, Arun Sharma
2. Fast Track Objective Arithmetic, Rajesh Verma, Arihant Publication
3. Quantitative Aptitude Quantum CAT Common Admission Tests for Admission into IIMs,Sarvesh K. Verma
4. Wiley's Exam Xpert Quantitative Ability for CAT, 2ed, Ashu Ja

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	1	-	-	-	-	-	-	2	-	3	-	3	-	-	-
CO 2	-	-	-	-	-	2	2	1	-	3	-	-	-	-	-
CO 3	3	3	3	3	-	-	-	-	-	1	-	-	-	-	-
CO 4	3	2	1	3	-	-	-	-	-	1	-	-	-	-	-
CO 5	1	1	1	1	-	-	-	-	-	3	-	-	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

SEMESTER V

U23CE501 **DESIGN OF REINFORCED CONCRETE STRUCTURAL ELEMENTS** **Category: PCC**

SDG:

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. To acquire importance of design concepts and design of RC rectangular beam.
2. To study the design strength of flanged beams, design for shear & torsion.
3. To analysis the behavior of RC slabs and staircase design.
4. To know about the design short columns for axial, uni-axial and bi-axial eccentric loadings.
5. To Understand the design of wall footing, isolated footing and combined rectangular footing.

UNIT 1 INTRODUCTION 9

Objective of structural design - Type of Loads on Structures and Load combinations - Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC – Properties of Concrete and Reinforcing Steel - Analysis and Design of Singly reinforced rectangular beams by working stress method - Limit State philosophy as detailed in IS code.

UNIT 2 DESIGN OF BEAM 9

Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method - Analysis and design of Flanged beams for flexure - Design requirements as per current code.

UNIT 3 DESIGN OF COLUMN 9

Types of columns –Axially Loaded columns –Design of short Rectangular Square and circular columns – Design of Slender columns - Design for Uniaxial and Biaxial bending.

UNIT 4 DESIGN OF SLABS AND STAIRCASE 9

Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams - Two-way slab - Design of simply supported and continuous slabs using IS code coefficients- Types of Staircases –Design of dog-legged Staircase.

UNIT 5 DESIGN OF FOOTING 9

Concepts of Proportioning footings and foundations based on soil properties - Design of wall footing – Design of axially and eccentrically loaded square, rectangular pad and sloped footings – Design of Combined Rectangular footing for two columns only.

COURSE OUTCOMES:

At the end of the course the student will able to

CO1 Know the various design concepts and design RC rectangular beams by working stress and limit state methods.

CO2 Understand the design of flanged beams, design for shear and torsion, and anchorage and development length.

CO3 Design a RC slabs and staircase and draw the reinforcement detailing.

CO4 Design short columns for axial, uni-axial and bi-axial eccentric loadings.

CO5 Design wall footings, isolated footings and combined rectangular footing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1.Varghese .P.C, “Limit State Design Of Reinforced Concrete”, 2nd Edition, PHI Learning Pvt.Ltd., 2014.

2.Krishnaraju. R, Pranesh. R.N, “Design of Reinforced concrete IS: 456- 2000”, New ageInternational Publication (P) Ltd., New Delhi, 2016.

3.Unnikrishna Pillai.S and Deavadas Menon, “Reinforced Concrete Design,” Tata MacGrawHill Publishing Company Limited, Second Edition, New Delhi, 2013.

REFERENCE BOOKS:

1.Gambhir. M.L, “Design of Reinforced Concrete Structures”, Prentice Hall of India, Pvt. Ltd., New Delhi, 2008.

2.Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, “Limit State Design of Reinforced Concrete”, Laxmi Publication Pvt. Ltd., New Delhi, 2007.

3.Jain, A.K., “Limit State Design of RC Structures”, Nemchand Publications, Roorkee, 1998.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	2	-	1	-	-	-	3	3	3	3
CO2	3	2	3	1	1	2	-	1	-	-	-	3	3	3	2
CO3	3	2	2	1	1	1	-	1	-	-	-	3	3	3	3
CO4	3	2	3	1	1	1	-	1	-	-	-	3	3	3	3
CO5	3	2	3	1	1	2	-	2	-	-	-	3	3	3	3

Correlation levels: **1 – low** **2 – medium** **3 – high** **"-"- no correlation**

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE502 **STRUCTURAL ANALYSIS I** **L T P C**

SDG:9 **3 0 0 3**

COURSE OBJECTIVE :

1. To understand the basic theory and concepts of structural analysis.
2. To calculate energy and classical methods for analysis of buildings.
3. To identify and analyse arches, cables and suspension bridges

UNIT 1 ANALYSIS OF TRUSSES 9

Determinate and indeterminate trusses - analysis of determinate trusses - method of joints - method of sections - Deflections of pin-jointed plane frames - lack of fit - change in temperature method of tension coefficient - Application to space trusses..

UNIT 2 SLOPE DEFLECTION METHOD 9

Slope deflection equations – Equilibrium conditions - Analysis of continuous beams and rigid frames – Rigid frames with inclined members - Support settlements - symmetric frames with symmetric and skew-symmetric loadings.

UNIT 3 MOMENT DISTRIBUTION METHOD 9

Stiffness - distribution and carry over factors –- Analysis of continuous Beams- Plane rigid frames with and without sway – Support settlement - symmetric frames with symmetric and skew-symmetric loadings.

UNIT 4 FLEXIBLITY METHOD 9

Stress tensor at a point – Stress invariants - Determination of principal stresses and principal planes - Primary structures - Compatibility conditions – Formation flexibility matrices - Analysis of indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach.

UNIT 5 STIFFNESS METHOD 9

Restrained structure –Formation of stiffness matrices - equilibrium condition - Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method.

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1: Analyze the pin-jointed plane and space frames.

CO2: Analyse the continuous beams and rigid frames by slope defection method.

CO3: Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway.

CO4: Analyse the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method..

CO5: Understand the concept of matrix stiffness method and analysis of continuous beams, pin

jointed trusses and rigid plane frames**.**

TEXT BOOKS:

1. Bhavikatti, S.S,Structural Analysis,Vol.1,& 2, Vikas Publishing House Pvt.Ltd.New Delhi-4, 2014..
2. Punmia.B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications, New Delhi, 2004

REFERENCES:

1. William Weaver, Jr and James M.Gere, Matrix analysis of framed structures, CBS Publishers & Distributors, Second Edition, Delhi, 2004
2. Reddy .C.S, “Basic Structural Analysis”, Tata McGraw Hill Publishing Company, 2005.
3. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing House Pvt.Ltd.,New Delhi-4, 2014.

CO’s-PO’s&PSO’s MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	3	1	1	3	2	2	1	3	2	3
CO2	3	3	3	1	1	3	1	1	3	2	2	1	2	3	2
CO3	3	3	2	1	1	3	1	1	3	2	2	1	3	3	3
CO4	3	3	3	1	1	3	1	1	3	2	2	1	3	3	3
CO5	3	3	3	1	1	3	1	2	3	2	3	2	2	3	2

Correlationlevels: 1– low 2– medium 3 – high “-“-no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/Associate Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category:PCC

U23CE503 FOUNDATION ENGINEERING L T P C

SDG: 9 3 0 0 3

COURSE OBJECTIVE :

1. To familiarized with a basic understanding of the essential steps involved in a geotechnical site investigation
2. To Learn the principle types of foundation and the factors governing the choice of the most suitable type of foundation for a given solution, settlement of foundation
3. Get familiarized with the procedures used for: a) bearing capacity estimation, b) load carrying capacity of pile c) determining earth pressure and d) concept on stability of slope.

UNIT 1 SOIL EXPLORATION AND SELECTION OF FOUNDATION 9

Scope and objectives – Methods of exploration – Depth and spacing of bore holes – Soil samples – Representative and undisturbed – Sampling methods –Types of samplers– Penetration tests (SPT and SCPT) – Data interpretation - - Selection of foundation based on soil condition- Bore log report.

UNIT 2 BEARING CAPACITY OF SHALLOW FOUNDATION 9

Introduction – Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation -Allowable bearing pressure – Seismic considerations in bearing capacity evaluation- Determination of Settlement of foundations on granular and clay deposits– Methods of minimizing total and differential settlements.

UNIT 3 FOOTINGS AND RAFTS 9

Types of footing– Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour –Applications – Floating foundation – Special foundations – Seismic force consideration

UNIT 4 PILE FOUNDATION 9

Types of piles and their functions – Factors influencing the selection of pile – Carrying capacity of single pile– Static formula – Dynamic formulae– Capacity from insitu tests (SPT, SCPT) – Negative skin friction – Uplift capacity- Group capacity by different methods – Settlement of pile groups Under reamed piles

UNIT 5 RETAINING WALLS 9

Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Culmann Graphical method – Pressure on the wall due to line load – Stability analysis of retaining walls

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1: Plan and execute a detailed site investigation to select geotechnical design parameters and type of foundation

Get Knowledge on bearing capacity and testing methods

CO3: Demonstrate an ability to design shallow foundations , combined footings and raft foundations, its component or process as per the needs and specifications

CO4: Design Pile foundations and its component or process as per the needs and specifications. CO5: Design retaining walls, its component or process as per the needs and specifications.

TEXT BOOKS

1. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2015
2. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016

REFERENCE BOOKS

1. Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2017.
2. Varghese, P.C.,"Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2012.
3. Das, B.M., "Principles of Geotechnical Engineering". Brooks / Coles / Thompson Learning Singapore, 8th Edition, 2013.

CO's-PO's & PSO's MAPPING															
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	2	3	2	2	3	1	1	1	2	1	2	3	3	3	2
CO2	3	2	3	2	3	1	1	1	2	1	2	3	2	2	3
CO3	3	3	2	2	2	2	1	1	2	1	2	3	2	2	3
CO4	2	3	3	2	2	1	1	1	1	1	2	3	2	2	3
CO5	3	3	2	2	2	1	1	1	1	1	1	3	2	3	2
Correlation levels:			**1– low**			**2– medium**				**3 – high**		**"-"-no correlatio**			

COURSE DESIGNED BY	**APPROVED BY**
Mrs.JK Sowmiya/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE504 CONSTRUCTION PROJECT MANAGEMENT Category:PCC

SDG 9

L T P C

3 0 0 3

COURSE OBJECTIVE :

To study the project life cycle in construction To understand the project network analysis

UNIT 1 INTRODUCTION 9

Introduction - Project life cycle – Types of construction – Selection of Professional Services – Construction Project Characteristics – Role of Project Managers – Leadership and Motivation for the Project Team – Contract Management**.**

UNIT 2 PROJECT FORMULATION 9

Project – Concept – Capital investments – Generation and Screening of Project ideas – Project identification – Preliminary analysis, Market, Technical, Financial, Economical and Ecology – Pre-Feasibility Report and its Clearance**.**

UNIT 3 PROJECT NETWORK ANALYSIS 9

Project Plan – Types – Defining Project activities – Work breakdown structure – Resources leveling – CPM – PERT – Precedence networks for construction

UNIT 4 MATERIAL, LABOUR AND SAFETY MANAGEMENT 9

Labour Productivity – Factors Affecting Job – Site Productivity – Labour Relations in Construction – Materials Management – Material Procurement and Delivery – Inventory Management - Safety Management – Importance – Safety Measures

UNIT 5 COST AND QUALITY CONTROL MANAGEMENT 9

Factors influencing construction quality – Responsibility and authority – Quality plan – Quality management Guidelines – Control Control– Cost control methods and techniques – Control of Project cash flow.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 Understand the project life cycle and role of project manager.

2 Outline the project formulation, preliminary analysis and feasibility report

3 Apply the network analysis in construction project

4 Explain the material labour and safety management in construction

5 Summarize the cost and quality control management in construction

TEXT BOOKS

1. Chitkara, K.K, “ Construction Project Management”, 1st edition, McGraw Hill, 2019

2. Srinath, L.S., “PERT and CPM Principles and Applications”, 2nd edition, Affiliated East West Press, 2001

REFERENCE BOOKS

1. Frederick E, Gould and Nancy Eleanor Joyce, Construction Project Management", Pearson Education, London, 5th edition, 2011
2. George J Ritz, " Total Construction project Management", McGraw Hill Inc, New York, 6th Edition 2013.

CO's-PO's&PSO'sMAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3					3		1	3	2	1	3			
CO2	3					3		1	3	2	1	3			
CO3	3	3				3		1	3	2	1	3			
CO4	3					3		1	3	2	1	3			
CO5	3					3		2	3	2	1	3			

Correlationlevels: 1–low 2–medium 3 –high "-"-nocorrelation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE511 STRUCTURAL DESIGN AND DRAWING LABORATORY Category: PCC

SDG:9

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. To Develop Skill to use Software to Create 2D Floor plan of residential and commercial building.
2. To apply basic concept to drawing, edit, dimension, hatching etc. to develop 2D building.
3. To make 2D drafting along with detailing.

LIST OF EXPERIMENT:

1. Design and Draft the Rectangular Column.
2. Design and draft the isolated footing.
3. Draw a plan, elevation and section for the combined footing with two column.
4. Draw the cantilever and counterfort retaining wall.
5. Draft the RCC T Beam bridge deck.
6. Design the Underground Rectangular water tank.
7. Draw an elevated circular water tank.
8. Draw the detail diagram of Buildup column base and foundation in steel.
9. Draw a simple steel roof trusses.
10. Draw a plate girder and gantry girder.
11. Draw a framed connection and detailing with industrial building elements.

TEXBOOKS:

1. Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
2. Krishnaraju.N " Design of Reinforced Concrete Structurres ", CBS Publishers & Distributors Pvt. Ltd., New Delhi.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	2	-	1	-	-	-	3	3	3	3
CO2	3	2	3	1	1	2	-	1	-	-	-	3	3	3	2
CO3	3	2	2	1	1	1	-	1	-	-	-	3	3	3	3
CO4	3	2	3	1	1	1	-	1	-	-	-	3	3	3	3
CO5	3	2	3	1	1	2	-	2	-	-	-	3	3	3	3
Correlation levels:	**1 – low**			**2 – medium**					**3 – high**			**"-"- no correlation**			

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23EE517 **Campus to Corporate- I (Common to all Branches)** **Category : BSC**

SDG: 4

L	T	P	C
1	0	1	1

COURSE OBJECTIVE

1. To orient students to the course structure, clarify learning expectations, and reinforce the importance of aptitude skills in the placement process through a quick recap of concepts and practice from previous placement papers.
2. To develop students' verbal communication proficiency through speech crafting, role-play exercises, and structured presentation practice, enabling them to communicate ideas confidently and effectively in academic and professional contexts.
3. To enhance students' understanding of current industry trends, expectations, and hiring practices, and to equip them with a structured resume inventory that reflects their skills, qualifications, and achievements accurately.
4. To strengthen students' analytical and visual reasoning skills by practicing figure series, figure matrices, analogies, mirror and water images, counting figures, and embedded figures, preparing them for aptitude and competitive assessments.
5. To improve grammatical accuracy and fluency in English through targeted practice in tenses for daily conversation, sentence correction (focusing on tenses and subject–verb agreement), and correct usage of articles, thereby enhancing overall language competence for interviews and workplace communication.

UNIT 1 **Introduction** **4**

Course Introduction: Introduction about the Course - Learning expectations - Recap of Aptitude (Placement Papers)

UNIT 2 **Speaking Skills -Novice** **12**

Speaking Skills –Vantage: Speech Craft – Role Play - Presentation Skills

UNIT 3 **Placement Readiness II** **2**

Industry Awareness - Resume Inventory

UNIT 4 **Non-Verbal Reasoning** **6**

Figure series, Figure Matrix, Figure Analogy, Mirror and Water Image, Counting Figures – Embedded Figures

UNIT 5 **Language Gym – English Proficiency** **6**

Tenses for daily conversation, Sentence Correction (Tenses & SV Agreement) – Articles

COURSE OUTCOMES:

Upon completion of this course,

CO1:Students will be able to participate in any learning activity without any reservations. They shall be ready to move beyond their comfort zone to acquire new skills throughout their life.

CO2:Explain the expectations, and the role of aptitude in the placement process .

CO3:Analyse current industry trends and prepare a comprehensive resume that aligns with employer expectations.

CO4:They shall prepare themselves to kick start their career by taking a stock of their existing skills and plan to acquire new skills required to achieve their goals .

CO5:Solve non-verbal reasoning problems including figure series, matrices, analogies, mirror/water images, counting, and embedded figures with accuracy and speed.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Dinesh Khattar. Pearson
2. Quantitative Aptitude Dr. R.S. Aggarwal S. Chand Publication
3. A modern Approach to Verbal and Non-Verbal Reasoning R.S. Aggarwal
4. A Modern Approach to Verbal & Non-Verbal Reasoning - Aggarwal R. S

REFERENCES:

1. Quantitative Aptitude for CAT, Arun Sharma
2. Fast Track Objective Arithmetic, Rajesh Verma, Arihant Publication
3. Quantitative Aptitude Quantum CAT Common Admission Tests for Admission into IIMs,Sarvesh K. Verma
4. Wiley’s Exam Xpert Quantitative Ability for CAT, 2ed, Ashu Jain

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	1	-	-	-	-	-	-	1	-	3	-	-	-	-	-
CO 2	1	-	-	-	-	-	-	1	-	3	-	-	-	-	-
CO 3	1	-	-	-	-	-	-	1	-	3	-	-	-	-	-
CO 4	1	-	-	-	-	-	-	1	-	3	-	-	-	-	-
CO 5	3	-	-	-	-	-	-	1	1	-	-	-	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

U23CE601 DESIGN OF STEEL STRUCTURES Category : ESC
SDG:

L	T	P	C
2	0	0	2

COURSE OBJECTIVE:

1. To introduce the students to limit state design of structural steel members subjected
2. to compressive, tensile and bending loads, including connections and to provide the students
3. the tools necessary for designing structural systems such as roof trusses and gantry girders as per provisions of current code (IS 800 - 2007) of practice.
4. Enable students to interpret and apply relevant design codes (such as IS 800:2007 or AISC).
5. Develop skills to design tension members, compression members, beams, and beam-columns

UNIT 1 INTRODUCTION TO STRUCTURAL STEEL AND DESIGN OF CONNECTIONS 9

General -Types of Steel -Properties of structural steel - I.S. rolled sections - Concept of Limit State Design - Design of Simple and eccentric Bolted and welded connections - Types of failure and efficiency of joint – prying action - Introduction to HSFG bolts

UNIT 2 DESIGN OF TENSION AND COMPRESSION MEMBERS 9

Behaviour and Design of simple and built-up members subjected to tension - Shear lag effect- Design of lug angles - tension splice - Behaviour of short and long columns - Euler's column theory- Design of simple and built-up compression members with lacings and battens - Design of column bases - slab base and gusseted base**.**

UNIT 3 DESIGN OF BEAMS 9

Design of laterally supported and unsupported beams - Design of built-up beams - Design of plate girders.

UNIT 4 INDUSTRIAL STRUCTURES 9

Design of roof trusses – loads on trusses – purlin design using angle and channel sections – truss design, Design of joints and end bearings–Design of gantry girder - Introduction to pre-engineered buildings**.**

UNIT 5 PLASTIC ANALYSIS AND DESIGN 9

Introduction to plastic analysis - Theory of plastic Analysis - Design of continuous beams and portal frames using plastic design approach

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Recognize the design philosophy of steel structures and identify the different failure modes of bolted and welded connections, and determine their design strengths.

CO2: Select the most suitable section shape and size for tension and compression members and beams according to specific design criteria.

CO3: Apply the principles, procedures and current code requirements to the analysis and design of steel tension members, columns, column bases and beams.

CO4: Identify and compute the design loads on Industrial structures, and gantry girder.

CO5: Find out ultimate load of steel beams and portal frames using plastic analysis.

TOTAL: 45 PERIODS

TEXT BOOKS:

1 Duggal S.K., Design of Steel Structures, Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 2010 2.Bhavikatti S.S, Design of Steel Structures, Ik International Publishing House, New Delhi, 2017

REFERENCES:

1. Gambhir M L, Fundamentals of Structural Steel Design, McGraw Hill Education India Pvt Limited, 2013
2. Jack C. McCormac and Stephen F Csernak, Structural Steel Design, Pearson Education Limited, 2013.
3. Sarwar Alam Raz, Structural Design in Steel, New Age International Publishers, 2014
4. Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi, 2016

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	2	-	-	-	-	-	2	3	2	2
CO2	2	2	3	-	2	-	-	-	-	-	2	2	2	2	2
CO3	2	2	3	-	2	-	-	-	-	-	2	2	3	2	3
CO4	3	2	3	-	2	2	2	2	2	-	1	3	3	2	3
CO5	2	3	3	2	-	-	-	-	-	1	-	3	-	-	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE602 **STRUCTURAL ANALYSIS II** **Category: PCC**

SDG:4

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. To learn the method of drawing influence lines and its uses in various applications.
2. To introduce the basic concepts and application of the Finite Element Method for structural analysis.
3. To Understand the analyse the Arch Structure.
4. To analyse the arches and suspension bridges.
5. To analyse the frames and design it.

UNIT 1 INFLUENCE LINES FOR DETERMINATE AND INDETERMINATE STRUCTURES 9

Introduction to moving loads, Concept of Influence Lines, Influence lines for reactions in statically determinate structures –Influence lines for shear force and bending moment in beam section – Calculation of critical stress resultants due to concentrated and distributed moving loads - Influence lines for member forces in pin jointed plane frames. Muller Breslau's principle - Influence line for support reactions, shearing force and bending moments for indeterminate beams - propped cantilevers, fixed beams and continuous beams

UNIT 2 FINITE ELEMENT METHOD 9

Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain - Triangular elements

UNIT 3 ARCHES 9

Arches - Eddy's theorem - Types of arches – Analysis of three-hinged, two-hinged and fixed arches - Parabolic and circular arches - influence lines, rib shortening– Settlement and temperature effects**.**

UNIT 4 SUSPENSION BRIDGES AND SPACE TRUSSES 9

Analysis of suspension bridges – Unstiffened cables and cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders - Introduction to analysis of space trusses using method of tension coefficients.

UNIT 5 APPROXIMATE ANALYSIS OF FRAMES 9

Approximate analysis for gravity loadings - substitute frame method for maximum moments in beams and columns - Approximate analysis for horizontal loads - portal method and cantilever method - assumptions - axial force, shearing force and bending moment diagrams.

COURSE OUTCOMES:

At the end of the course the student will able to

CO1 Draw influence lines for statically determinate and indeterminate structures and calculate critical stress resultants.

CO2. Apply the basic Finite Element Method to analyse simple structural elements.

CO3 Analyse three hinged, two hinged and fixed arches.

CO4 Analyse the suspension bridges with stiffening girders

CO5. Analyze rigid frames by approximate methods for gravity and horizontal loads.

TOTAL: 45 PERIODS

TEXBOOKS:

1. Bhavikatti, S.S,Structural Analysis,Vol.1,& 2, Vikas Publishing House Pvt.Ltd.New Delhi-4, 2014.
2. Punmia.B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications, New Delhi, 2004.

REFERENCES:

1. William Weaver, Jr and James M.Gere, Matrix analysis of framed structures, CBS Publishers & Distributors, Second Edition, Delhi, 2004.
2. Reddy .C.S, "Basic Structural Analysis", Tata McGraw Hill Publishing Company, 2005.
3. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing House Pvt.Ltd.,New Delhi-4, 2014.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	2	1	1	3	2	2	1	3	3	3
CO2	3	2	3	1	1	2	1	1	3	2	2	1	3	3	2
CO3	3	2	2	1	1	1	1	1	3	2	2	1	3	3	3
CO4	3	2	3	1	1	1	1	1	3	2	2	1	3	3	3
CO5	3	2	3	1	1	2	1	2	3	2	2	1	3	3	3
Correlation levels:	**1 – low**			**2 – medium**				**3 – high**			**"-"- no correlation**				

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/Associate Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE612 **DESIGN STUDIO : 3D MODELING** **Category: PCC**

SDG:

L	T	P	C
0	0	4	2

COURSE OBJECTIVE:

1. To Develop Skill to use Software to Revit Architecture.
2. To apply basic concept to drawing, edit, dimension, hatching etc. to develop 3D model house.
3. To make 3D elevation along with detailing**.**

***MODULUS* :**

1. Study on exploring the user interface in revit architecture.
2. Creating drawing sheet and plotting.
3. Create the modifying & drafting tools.
4. Creating a wall compound.
5. Create a basic building components of doors & windows.
6. Create the customize dimension & modify dimension.
7. Creating floor components.
8. Creating roof / ceiling.
9. Creating staircase and handrail.
10. Creating 3d view.

TEXBOOKS:

1. Gambhir.M.L., "Fundamentals of Building Services", Prentice Hall of India Private Limited, New Delhi, 2006.
2. Krishnaraju.N " Modern Construction drafting", CBS Publishers & Distributors Pvt. Ltd., New Delhi.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2		-	1	-	-	-	1	3	2	-
CO2	3	2	-	-	2	3	-	2	3	2	-	2	3	2	2
CO3	3	2	-	-	2	3	-	2	3	2	-	2	3	2	2
CO4	3	2	-	2	2	3	-	1	3	2	-	2	3	2	2
CO5	3	2	-	2	2	3	-	2	3	2	-	2	3	2	2
Correlation levels:			1 – low			2 – medium				3 – high		"-"- no correlation			

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE611 **DESIGN PROJECT** **Category: EEC**

SDG:9

L	T	P	C
0	0	4	2

COURSE OBJECTIVE:

1. To use the knowledge acquired in Civil Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

***STRATEGY*:**

1. To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2		-	1	-	-	-	1	3	2	-
CO2	3	2	-	-	2	3	-	2	3	2	-	2	3	2	2
CO3	3	2	-	-	2	3	-	2	3	2	-	2	3	2	2
CO4	3	2	-	2	2	3	-	1	3	2	-	2	3	2	2
CO5	3	2	-	2	2	3	-	2	3	2	-	2	3	2	2
Correlation levels:			1 – low				2 – medium			3 – high		"-"- no correlation			

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CE701 ESTIMATION AND QUANTITY SURVEYING L T P C

SDG 9 3 0 0 3

Category:PCC

COURSE OBJECTIVE :

1. Understand the standard methods of measurement and units for estimating.
2. Learn the procedures involved in preparing detailed estimates of buildings and other civil works.
3. Acquire knowledge of costing, valuation, and rate analysis.
4. Understand the process of tendering, contract, and billing procedures.
5. Apply estimation principles to real-life engineering projects using specifications and standards

UNIT 1 ESTIMATE OF BUILDINGS 9

Standard units of measurement – Rules of measurements – Methods of taking out quantities – Centre line, crossing, long wall-short wall methods - Detailed and abstract estimates of residential and public buildings (RCC and load-bearing structures) - Estimation of earthwork for foundations, brickwork, RCC works, plastering, painting, and flooring. - Preparation of bill of quantities.

UNIT 2 ESTIMATE OF OTHER STRUCTURES 9

Estimation of culverts (slab, box, and pipe culvert) - Estimation of roads and irrigation structures – channels, retaining walls, and overhead tanks - Estimation of septic tanks, soak pits, and compound walls.

UNIT 3 SPECIFICATION AND COSTING 9

General and detailed specifications – Purpose and importance - Preparation of specifications for common items of work: Earthwork, concrete, brickwork, plastering, painting, flooring, doors, and windows - Data for estimation – Schedule of rates, analysis of rates for different items of work – Labour and material components.

UNIT 4 CONTRACTS AND TENDERS 9

Types of contracts – Conditions of contract – Tender and tender documents – Preparation of tender notice - E-tendering – Earnest money deposit, security deposit – Arbitration and disputes – Termination of contract – Measurement book, completion certificate.

UNIT 5 VALUATION AND REPORT PREPARATION 9

Concepts of valuation – Depreciation – Methods of valuation – Valuation of land and buildings - Rental method, profit method, and cost method - Preparation of valuation report and detailed project report (DPR) - Case study of a small project estimation and valuation.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1	Understand the standard methods of measurement and units for estimating civil works**.**
2	Prepare detailed and abstract estimates for buildings and other civil engineering structures
3	Write detailed specifications and analyze rates for various construction items
4	Understand the various types of contracts, tender procedures, and documentation.
5	Perform valuation of buildings and land, and prepare detailed project reports.

TEXT BOOKS

1. B.N. Dutta, Estimating and Costing in Civil Engineering (Theory and Practice), UBS Publishers, New Delhi, 2020
2. D.C. Kohli & R.C. Kohli, A Textbook of Estimating and Costing (Civil), S. Chand & Company Ltd., 2019.

REFERENCE BOOKS

1. Rangwala, S.C., Estimating, Costing and Valuation, Charotar Publishing House, Anand, 2019.
2. Birdie, G.S., Textbook of Estimating and Costing, Dhanpat Rai Publishing Company, 2020.
3. Tamil Nadu PWD Schedule of Rates (Latest Edition).

CO's-PO's&PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	1										3	2	2
CO2	3	3	2	2	1								3	3	3
CO3	2	2	3	2	2					1			2	2	2
CO4	2	2	2	2			1	1	1	2	2	1	2	2	1
CO5	2	3	3	2	2					2	2	2	3	3	3

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE702 CONSTRUCTION EQUIPMENT AND MACHINERY Category:PCC

SDG 9 **L T P C**

3 0 0 3

COURSE OBJECTIVE :

To expose the students in the field of construction equipment and machineries so as to gain knowledge in carrying out engineering tasks**.**

UNIT 1 CONSTRUCTION EQUIPMENTS 9

Identification – Planning of equipment – Selection of equipment – Equipment management in projects- Maintenance management - Equipment cost - Operating cost - Cost control of equipment - Depreciation analysis - Replacement analysis - Safety management**.**

UNIT 2 EQUIPMENT FOR EARTHWORK 9

Fundamentals of earthwork operations - Earthmoving operations –Types of earthwork equipment - Tractors, motor graders, scrapers, front end waders - Dozer, excavators, rippers, loaders, trucks and hauling equipment, compacting equipment, finishing equipment - Case studies on earthwork equipment

UNIT 3 OTHER CONSTRUCTION EQUIPMENT 9

Equipment for dredging, trenching, drag line and clamshells, tunneling - Jacking equipment - Equipment for drilling and blasting - Pile driving equipment - Erection equipment - Crane, mobile crane - Types of pumps used in construction - Equipment for dewatering, grouting and demolition

UNIT 4 ASPHALT AND CONCRETE PLANTS 9

Aggregate production - Different crushers - Feeders - Screening equipment - Handling equipment - Batching and mixing equipment - Ready mix concrete equipment, concrete pumping equipment - Asphalt plant - Asphalt pavers - Asphalt compacting equipment**.**

UNIT 5 MATERIALS HANDLING EQUIPMENT 9

Forklifts and related equipment - Portable material bins - Material handling conveyors - Material handling cranes - Industrial trucks - Aerial transporting equipment.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1	Develop knowledge on planning of equipment and selection of equipment
2	Explain the knowledge on fundamentals of earthwork operations, earthmoving operations and types of earth work equipment
3	Develop the knowledge on special construction equipment
4	Apply the knowledge on asphalt and concrete plants

5 Apply the knowledge and select the proper materials handling equipment

TEXT BOOKS

1. Peurifoy,R.L., Schexnayder,C., Schmitt,R.L .and Aviad Shapira., ConstructionPlanning, Equipment and Methods, 9th Edn. McGraw Hill, Singapore, 2018. Granberg G., Popes cum Construction Equipment and Management for Engineers

2. Estimators and Owners, Taylor and Francis Publishers, New York, 2006

REFERENCE BOOKS

1.Deodhar, S.V.Construction Equipment and Job Planning, 4thEdn.KhannaPublishers,NewDelhi, 2020.

2.Arora S.P.and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat and Sons, 2018.

3.SharmaS.C. Construction Equipment and Management, Khanna Publishers,NewDelhi,200

CO's-PO's&PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O	PS O2	PS O3
CO1	2	2	3	2	2	3	2	2	3	2	2	2	3	2	3
CO2	3	3	2	2	3	2	2	2	2	2	3	3	2	2	3
CO3	2	3	2	2	2	3	2	2	3	2	2	2	2	3	2
CO4	2	2	3	3	2	3	3	2	3	2	2	2	3	2	3
CO5	3	2	3	2	3	2	3	3	3	2	2	2	2	2	3

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

Category:PCC

U23CE711	**PROJECT WORK:PHASE I**	**L T P C**
SDG 9		**3 0 0 3**

OBJECTIVES:

1. To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
2. To develop the methodology to solve the identified problem.
3. To train the students in preparing project reports and to face reviews and viva-voce examination

STRATEGY

The student individually or a team works on a specific topic approved by the head of the division under the guidance of a faculty member who is familiar in this area of interest. The student can select any topic which is relevant to the area of construction engineering and management. The topic may be theoretical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work.

TOTAL: 60 PERIODS

OUTCOME:

At the end of the course the students will have a clear idea of his/her area of work and they are in a position to carry out the remaining phase II work in a systematic way**.**

CO's-PO's&PSO's MAPPING															
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O**	**PS O**	**PS O3**
CO1	**2**	**3**	**-**	**3**	**1**	**-**	**2**		**1**	**1**	**-**	**2**	**2**	**3**	**1**
CO2	**2**	**3**	**3**	**2**	**2**	**1**	**2**		**1**	**1**	**1**	**2**	**3**	**3**	**2**
CO3	**1**	**1**	**2**	**-**	**1**	**1**	**-**		**2**	**3**	**2**	**2**	**2**	**2**	**2**
Correlation levels:				**1– low**			**2– medium**			**3 – high**		**"-"-no correlation**			

COURSE DESIGNED BY	**APPROVED BY**
Dr.M.Vadivel/Assistant Professor **Department of Civil Engineering**	**Dr.M.Samuel Thanaraj/Associate Professor** **Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category:PCC

U23CEI01 **INTERNSHIP TRAINING** **L T P C**

SDG 9 **3 0 0 3**

OBJECTIVE:

To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks. To develop skills in facing and solving the field problems..

STRATEGY:

The students individually undertake training in reputed civil engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

OUTCOMES:

At the end of the course the student will be able to understand

The intricacies of implementation textbook knowledge into practice The concepts of developments and implementation of new techniques

CO's-PO's&PSO's MAPPING															
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O**	**PS O**	**PS O3**
CO1	**3**	**3**	**2**	**2**	**2**	**1**	**1**		**1**	**1**	**1**	**2**	**3**	**2**	**2**
CO2	**3**	**3**	**2**	**2**	**3**	**1**	**2**		**1**	**1**	**1**	**1**	**2**	**2**	**3**
Correlation levels:				**1– low**			**2– medium**			**3 – high**		**"-"-no correlation**			

COURSE DESIGNED BY	**APPROVED BY**
Dr.M.Vadivel/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CE811 **PROJECT WORK** **Category: EEC**

SDG:9

L	T	P	C
0	0	20	10

COURSE OBJECTIVE:

1. To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

***STRATEGY*:**

1. The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

OUTCOMES:

1. On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

TOTAL: 300 PERIODS

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2		-	1	-	-	-	1	3	2	-
CO2	3	2	-	-	2	3	-	2	3	2	-	2	3	2	2
CO3	3	2	-	-	2	3	-	2	3	2	-	2	3	2	2
CO4	3	2	-	2	2	3	-	1	3	2	-	2	3	2	2
CO5	3	2	-	2	2	3	-	2	3	2	-	2	3	2	2
Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation															

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

VERTICAL I: STRUCTURAL ENGINEERING **Category: PEC**

L	T	P	C
3	0	0	3

CONCRETE STRUCTURES

COURSE OBJECTIVE:

1. To acquire hands on experience in planning a structure using Indian Standard Codebook.
2. To study the various loads calculation using IS codes.
3. To analysis the types of structures for various loads and combination of load to be applied.
4. To know about the design and analysis the structures using Computer software/tools.
5. To Understand the Preparation of structural detail drawings using software.

UNIT 1 INTRODUCTION AND CODES 9

Geometric Parameters, Grade of concrete and steel for different elements, Exposure and cover requirements, Fire rating, Load Combinations, Serviceability Requirements, Analysis tools. Indian & International Codes for Reinforced concrete Design, Design loads, National Building Code 2016, Practical building example, drawing sizes and scale.

UNIT 2 LOADS ACTING ON STRUCTURES 9

Introduction, Dead, Live loads, Wind loading and Calculations of - force coefficients, Wind pressure, storey forces and base shears. Earthquake loading and Calculations of - acceleration coefficient, Time period, Base shear.Scheme Design, Concrete floor systems, Sizing and design of various slab systems, Beams, Reinforced Concrete Columns - Location and Shape, Design Axial Load, sizing, Lateral Load Systems, IS 1893-Requirements.

UNIT 3 MODELLING OF BASIC STRUCTURAL ELEMENTS 9

Introduction to Analysis & Modelling, Modelling of Cantilever, Portal Frame, three bay Portal Frame, 3D structural models - Geometry, gravity loads, defining earthquake loads, defining wind loads, Modelling Shear walls, Practical Structural Model of building, Structural models of Floor System, Estimation of deflections

UNIT 4 DESIGN OF STRUCTURAL ELEMENTS 9

Design of Beams- flexural reinforcement, shear reinforcement, Design of flat slabs- Flexural Reinforcement, shear reinforcement, Design of 2-way continuous slabs.Design of Reinforcements in Columns, Post processing, Design and arrangement of vertical reinforcement, horizontal reinforcement in the design of buildings.Design of shear walls - Sizing of elements based on Constructability aspects like formwork, concrete placement and compaction, rebar arrangement to satisfy economy and optimum utilisation.

UNIT 5 DETAILING OF STRUCTURAL ELEMENTS 9

Development of Reinforcement, Typical details of- flat slabs, two-way continuous slabs, beams, columns and shear wall, detailing and documentation.Case Studies : Structural analysis and design of a multi-storey building with load calculation (dead, live, wind and seismic) as per Indian standard codes using any Structural design and analysis Software.

COURSE OUTCOMES:

At the end of the course the student will able to

CO1 Plan a layout of a structure

CO2 Calculate loads using IS codes and various computational tools

CO3 Analyse the structure for various loads and load combination according to the relevant IS codes

CO4 Design and Analysis of structures using computer software/tools

CO5 Prepare the complete structural drawings using computer software

TOTAL: 45 PERIODS

REFERENCES:

1. Unnikrishna Pillai, S., Devdas Menon, “Reinforced Concrete Design”, Tata McGraw Hill Publishing Company Ltd., 2009. Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
2. Krishnaraju.N “ Design of Reinforced Concrete Structurres “, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
3. Sinha, S.N., “Reinforced Concrete Design”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002.
4. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, “Limit State Design of Reinforced Concrete”,Laxmi Publication Pvt. Ltd., New Delhi, 2007.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	-	3	-	2	1	-	3	1	-	1	3	3	1	2
CO2	3	-	-	2	1	-	-	-	1	-	1	-	3	1	2
CO3	3	2	-	3	3	-	-	3	1	2	1	-	3	2	3
CO4	3	3	2	3	3	-	-	1	1	-	1	2	2	3	3
CO5	3	3	2	3	3	-	2	1	1	-	1	2	2	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP12 REPAIR AND REHABILITATION OF STRUCTURES Category: PEC SD

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. To acquire importance of maintenance and repair of structures.
2. To study the strength and durability properties of concrete.
3. To analysis the behavior of development of concrete.
4. To know about the techniques for repair and protect.
5. To Understand the repair, rehabilitation and retrofitting methods.

UNIT 1 MAINTENANCE AND REPAIR STRATEGIES 9

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating damaged structure, causes of deterioration.

UNIT 2 STRENGTH AND DURABILITY OF CONCRETE 9

Quality assurance for concrete–Strength, Durability- Cracks, different types, causes–Effects due to climate, temperature, Sustained elevated temperature, Corrosion

UNIT 3 SPECIAL CONCRETES 9

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self-compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

UNIT 4 TECHNIQUES FOR REPAIR AND PROTECTION METHODS 9

Non-destructive Testing Techniques, Load Test for Stability-Epoxy injection, Shoring, Underpinning, Corrosion protection techniques–Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT 5 REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES 9

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage, earthquake-Transportation of Structures from one place to other –Structural Health Monitoring- demolition techniques-Engineered demolition methods-Case studies

COURSE OUTCOMES:

At the end of the course the student will able to

CO1 the importance of maintenance and assessment method of distressed structures CO2 the strength and durability properties, their effects due to climate and temperature CO3 recent development in concrete

CO4 the techniques for repair rand protection methods

CO5 repair, rehabilitation and retrofitting of structures and demolition methods.

TEXBOOKS:

1. Shetty.M.S.ConcreteTechnology-Theory and Practice,S.Chandand Company, 2008.
2. Vidivelli.B Rehabilitation of Concrete Structures Standard Publishes Distribution.1st edition 2009.
3. Varghese.P.C Maintenance Repair and Rehabilitation & Minor works of building, Prentice Hall India Pvt Ltd 2014.
4. Dodge Woodson.R Concrete Structures, Protection, Repair and Rehabilitation, Butterworth-Heinemann,Elsevier,New Delhi 2012

REFERENCES:

1. DovKominetzky.M.S.,-Design and Construction Failures, Galgotia, Publications Pvt.Ltd.,2001
2. Ravishankar.K. Krishnamoorthy.T.S, Structural Health Monitoring, Repair And Rehabilitation of Concrete Structures, Allied Publishers, 2004.
3. Hand Book on "Repair and Rehabilitation of RCC Buildings"–Director General works CPWD ,Govt of India , New Delhi–200
4. k onSeismic Retrofit of Buildings,CPWD and Indian Buildings Congress, Narosa Publishers, 2008.

CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1		**3**	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**3**	**3**
CO2		**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**3**	**2**
CO3		**3**	**3**	**3**	**3**	**1**	**1**	**1**	**3**	**1**	**2**	**1**	**2**	**3**	**3**	**3**
CO4		**3**	**3**	**3**	**2**	**2**	**1**	**1**	**2**	**1**	**3**	**1**	**3**	**3**	**3**	**3**
CO5		**3**	**3**	**3**	**3**	**2**	**1**	**1**	**3**	**1**	**3**	**1**	**3**	**3**	**3**	**3**
	Correlation levels:				**1 – low**			**2 – medium**			**3 – high**		**"-"- no correlation**			

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CEP13 **Prestressed Concrete Structures** **Category: PEC**

L	T	P	C
3	0	0	3

SDG:

COURSE OBJECTIVE:

1. To understand the theory and behaviour of prestressing concept.
2. To understand the design principles in flexure and shear.
3. To acquire the knowledge about the deflection and anchorage zone.
4. To perceive the composite and continuous beams.
5. To impart role of prestressing in structure members.

UNIT 1 INTRODUCTION 9

Basic principles of prestressing – Classification and types – Advantages over ordinary reinforced concrete – Materials – High strength concrete and high tensile steel – Methods of prestressing – Freyssinet, Magnel, Lee-McCall and Gifford Udall anchorage systems – Analysis of sections of stresses by stress concept, strength concept and load balancing concept – Losses of prestress in post -tensioned and pre-tensioned members.

UNIT 2 DESIGN FOR FLEXURE AND SHEAR 9

Basic assumptions of flexural design – Permissible stresses in steel and concrete as per I.S.1343 Code – Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for flexural capacity based on I.S. 1343 Code – Influence of Layout of cables in post- tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT 3 DEFLECTION AND DESIGN OF ANCHORAGE ZONE 9

Factors influencing deflections – Short-term deflections of uncracked members – Prediction of long-term deflections due to creep and shrinkage – Check for serviceability limit states. Determination of anchorage zone stresses in post-tensioned beams by Magnel's method, Guyon's method and I.S. 1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams– design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

UNIT 4 COMPOSITE BEAMS AND CONTINUOUS BEAMS 9

Analysis and design of composite beams – Shrinkage strain and its importance – Differential shrinkage - Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT 5 MISCELANEOUS STRUCTURES 9

Role of prestressing in members subjected to Tensile forces and compressive forces – Design of Tension members and Compression members - Design of Tanks, Pipes, Sleepers and Poles – Partial prestressing – methods of achieving partial prestressing, merits and demerits of partial prestressing.

COURSE OUTCOMES:

Students will be able to

CO1 Design a prestressed concrete beam accounting for losses.

CO2 Design for flexure and shear.

CO3 Design the anchorage zone for post-tensioned members and estimate the deflection in beams.

CO4 Design composite members and continuous beams.

CO5 Design water tanks, pipes, poles and sleepers.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
2. Pandit.G.S. and Gupta. S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2014

REFERENCES:

1. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
2. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2017.
3. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2017
4. Sinha.N.C. And Roy.S.K. Fundamentals of Prestressed Concrete, S.Chand and Co. Ltd., 2011

CO's-PO's & PSO's MAPPING															
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**3**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**1**	**1**
CO2	**3**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**3**	**2**
CO3	**3**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**3**	**2**
CO4	**2**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**2**
CO5	**2**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**3**	**3**	**2**
Correlation levels:				**1 – low**			**2 – medium**			**3 – high**		**"-"- no correlation**			

COURSE DESIGNED BY	*APPROVED BY*
Dr.M.Vadivel/Assistant Professor **Department of Civil Engineering**	**Dr.M.Samuel Thanaraj/Associate Professor** **Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CEP14 STRUCTURAL DESIGN AND DRAWING Category: PEC

SDG:9

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. To acquire importance of retaining walls.
2. To study the design of flab slab as per IS code provisions.
3. To analysis and design of RC and steel bridges.
4. To knowledge and design of RC and Steel water tanks.
5. To Understand the concept of designing the steel trusses and cantry girders.

UNIT 1 RETAINING WALLS 9

Reinforced concrete Cantilever and Counter fort Retaining Walls–Horizontal Backfill with Surcharge– Design of Shear Key-Design and Drawing**.**

UNIT 2 FLAT SLAB and BRIDGES 9

Design of Flat Slabs with and without drops by Direct Design Method of IS code- Design and Drawing - IRC Specifications and Loading – RC Solid Slab Bridge – Steel Foot-over Bridge- Design and Drawing**.**

UNIT 3 LIQUID STORAGE STRUCTURES 9

RCC Water Tanks - On ground, Elevated Circular, underground Rectangular Tanks–Hemispherical Bottomed Steel Water Tank –-Design and Drawing.

UNIT 4 INDUSTRIAL STRUCTURES 9

Structural steel Framing - Steel Roof Trusses – Roofing Elements – Beam columns – Codal provisions - Design and Drawing.

UNIT 5 GIRDERS AND CONNECTIONS 9

Plate Girders – Behaviour of Components-Deign of Welded Plate Girder-Design of Industrial Gantry Girders – Design of Eccentric Shear and Moment Resisting connections.

COURSE OUTCOMES:

At the end of the course the student will able to

CO1 Design and draw reinforced concrete Cantilever and Counterfort Retaining Walls

CO2 Design and draw flat slab as per code provisions

CO3 Design and draw reinforced concrete and steel bridges

CO4 Design and draw reinforced concrete and steel water tanks

CO5 Design and detail the various steel trusses and cantry girders

TOTAL: 45 PERIODS

TEXBOOKS:

1. Krishnaraju N, Structural Design and Drawing, Universities Press, 2009.
2. Punmia B.C,Ashok Kumar Jain and Arun KumarJain,Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

REFERENCES:

1. Krishnamurthy D,Structural Design and Drawing VolI,IIandIII,CBS Publishers, 2010.
2. Shah V L and Veena Gore,Limit State Design of Ste*el Structures*
3. IS800-2007,Structures Publications, 2009.
4. IS 456(2000) Indian Standard Plain and Reinforced Concrete-Code of Practice, Bureau of Indian Standards, New Delhi.
5. SP34 Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi.
6. IS 800 (2007) Indian Standard General Construction In Steel—Code of Practice, Bureau of Indian Standards, New Delhi.
7. IS 875 Part 1 (2003) Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures, Code of Practice-Dead Load, Bureau of Indian Standards, New Delhi.
8. IS 875 Part 2 (2003) Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures, Code of Practice-Imposed Load, Bureau of Indian Standards, New Delhi.
9. IS 875 Part 3 (2003) Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Code of Practice-Wind Load, Bureau of Indian Standards, New Delhi.
10. IS 3370 Part 1 (2009) Indian Standard Concrete Structures for Storage of Liquids-Code of Practice– General Requirements, Code of Practice, Bureau of Indian Standards, New Delhi.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	1	1	1	1	1	1	2	3	3	3
CO2	3	2	2	2	1	1	1	1	1	1	1	2	3	3	2
CO3	3	3	3	3	1	1	1	3	1	2	1	2	3	3	3
CO4	3	3	3	2	2	1	1	2	1	3	1	3	3	3	3
CO5	3	3	3	3	2	1	1	3	1	3	1	3	3	3	3
Correlation levels:			1 – low			2 – medium			3 – high			"-"- no correlation			

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP15 **PREFABRICATED STRUCTURES** **Category: PEC**

L	T	P	C
3	0	0	3

SDG: 9

COURSE OBJECTIVE

1. To introduce the basic concepts of prefabrication
2. To acquire the knowledge of prefabrication components and systems
3. To understand the design principles in prefabrication
4. To perceive the types of joints and connections in structural members
5. To impart knowledge about the structural stability.

UNIT 1 INTRODUCTION 9

Need for prefabrication -Advantages and limitations – Principles of prefabrication – Modular coordination – Standarization– Loads and load combinations– Materials – Production – Transportation – Erection.

UNIT 2 PREFABRICATED COMPONENTS AND SYSTEMS 9

Behaviour and types of structural components– roof and floor slabs – Walls panels - Shear walls - Beams - Columns – skeletal system- portal frame system-Large panel systems- block system.

UNIT 3 DESIGN PRINCIPLES 9

Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems- Design for stripping , stacking ,transportation and erection of elements.

UNIT 4 JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS 9

Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction joints , contraction joints, expansion joints. Design of expansion joints - Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT 5 DESIGN FOR ABNORMAL LOADS 9

Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse -case study.

COURSE OUTCOMES:

Students will be able to

CO1 Understand concepts about principles of prefabrication, production, transportation, erection.

CO2 Acquire knowledge about panel systems, slabs, beams, shear walls and columns used in precast construction**.**

CO3 Acquire knowledge about design of cross section, joint flexibility. CO4 Acquire knowledge about joints and connection in precast construction. CO5 Acquire knowledge about structural stability.

TEXTBOOKS:

1. Bruggeling A.S. G and Huyghe G.F. "Prefabrication with Concrete", A.A. Balkema Publishers, USA,1991.
2. Lewitt,M. " Precast Concrete- Materials, Manufacture, Properties And Usage ,CRC Press, 2019
3. Alfred Steinle, Hubert Bachmann, Mathias Tillmann, Philip Thrift . "Precast Concrete Structures", Ernst & Sohn, Berlin, 2019.

REFERENCES:

1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.
3. " Precast concrete connection details", Structural Design manual, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	3	3	2	1	2	3	2	2
CO2	3	1	2	1	1	3	1	3	1	2	1	2	3	2	2
CO3	3	3	3	3	3	3	1	3	2	2	1	2	3	2	2
CO4	3	2	2	2	1	3	1	3	2	2	1	2	3	2	2
CO5	3	2	3	3	1	3	1	3	1	2	1	2	3	2	2

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CEP16 STEEL CONCRETE AND COMPOSITE STRUCTURES Category: PEC

SDG: 9

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. To understand the layout of the structure and load applied of the steel structure.
2. To study the various loads calculation and modelling of steel structure.
3. To analysis the types of elements of a steel structure.
4. To know about the design of an industrial structure.
5. To Understand the Preparation of light gauge steel structure.

UNIT 1 DESIGN ASPECTS AND LOADS ON A STEEL BUILDING 9

Inputs for the design of a steel building - Design basis report, covering Site Data, geometrical, functional and structural requirements for its end usage - material specifications - Methods of designing a steel building. Calculating the various loads acting on a steel building - Vertical & Lateral loads - Effects of each loads separately and in combination – Dead, superimposed dead, live, temperature, MEP service loads - Lateral loads due to Wind and Seismic effects.

UNIT 2 SELECTION OF LOAD RESISTING SYSTEM AND MODELLING 9

OF STRUCTURE

Studying the layout plans of the structure - Selection of load resisting systems - Load flow in each system - Satisfying Stability and strength of the structure - Vertical and Lateral load resisting systems - Analysis and design of Sway and non-sway frames - Manual and Computer aided modelling, analysis and design - Geometric and structural parameters of the structure - Loading the structure - Interpretation of the results of the software – Analysis and Design of a multi-storeyed building.

UNIT 3 DESIGN OF VARIOUS ELEMENTS OF A STEEL BUILDING 9

Manual and Software aided design – Beams, columns, floors, bracings, purlins/girts and facades, base plates and anchor bolts – Various loads, different conditions of supports, exposure, and purpose of use - Design of Connections between the members – bolted and welded, moment and shear connections

UNIT 4 DESIGN OF AN INDUSTRIAL BUILDING 9

Functional requirements - Serviceability Requirements - Structural Configurations - Selection of sections as per requirements - Configuration of the elements, connectivity - Analysis and design of different types of trusses — Design of Gantry Girders – Design of gable frames – Design of steel columns for combined loading - Analysis and design of industrial buildings - Study of General assembly drawings - Fabrication processes - Fabrication, logistics & erection – Sequence of erection - Inspection of a completed structure**.**

UNIT 5 DESIGN OF LIGHT GAUGE STEEL STRUCTURES 9

Philosophy of design of light gauge steel members, Direct Strength Method (DSM) ,Effective width method (EWM) – Concept of buckling, local buckling and post-buckling strength - Analysis and design of Compression members– Analysis and design of flexural members, Lateral buckling of beams, Shear Lag, Flange Curling – Design of wall panels.

COURSE OUTCOMES:

Students will be able to

CO1 Plan the layout of the structure and calculate the loads of the steel structure. CO2 Select a load resisting system, model the structure and interpret the results. CO3 Design the various elements of a steel building

CO4 Design a typical industrial building

CO5 Design the various elements of a cold –formed steel buildings

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi, 2016
2. Negi L.S. “Design of steel structures” McGraw Hill Co., New Delhi, 2014
3. Duggal S.K., Design of Steel Structures, Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 2010

REFERENCES:

1. Gambhir M L, Fundamentals of Structural Steel Design, McGraw Hill Education India Pvt Limited, 2013
2. Jack C. McCormac and Stephen F Csernak, Structural Steel Design, Pearson Education Limited, 2013.
3. Sarwar Alam Raz, Structural Design in Steel, New Age International Publishers, 2014
4. Gaylord E H, Gaylord N C and Stallmeyer J E, “Design of Steel Structures”, 3rd edition, McGraw Hill Publications, 1992.

5. Salmon, Johnson & Malhas," Steel Structures: Design and Behavior, 4th Edition, Harper Collins College Publisher, 1996
6. Bhavikatti S.S, Design of Steel Structures, Ik International Publishing House, New Delhi, 2017.
7. Wie Wen Yu, Design of Cold Formed Steel Structures, McGraw Hill Book Company, 1996
8. www.nptel.ac.in
9. http://www.steel-insdag.org/TM_Contents.asp

INDIAN STANDARD CODES

1. IS: 800 – 2007, Code of Practice for general construction in steel, BIS, New Delhi
2. SP 6 (1) – Structural steel sections
3. IS 875 (1-5) - 1987 Code of practice for Design Loads (Other than Earthquake) for Buildings and Structures, BIS
4. IS 816 :1969 - Code of practice for Metal Arc Welding for general Construction in Mild Steel, BIS
5. IS: 808 – 1989 Dimensions For Hot Rolled Steel Beam, Column, Channel and Angle Sections.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	1	-	2	-	-	1	-	2	1	2	3	2	3
CO2	3	2	1	-	2	-	1	1	1	1	-	1	3	2	3
CO3	3	3	2	2	2	-	1	2	1	1	-	1	3	3	3
CO4	3	2	2	1	2	1	2	2	2	1	1	2	3	3	3
CO5	3	3	2	1	2	1	2	2	1	1	1	2	3	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	*APPROVED BY*
Dr.M.Vadivel/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CEP17 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING Category: PEC

SDG:

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. To acquire hands on experience in SDOF and MDOF system.
2. To study the various instrumentation used to identify the Seismology and Earthquake.
3. To analysis the behavior of various types of structures under earthquake.
4. To know about the force in earthquake zone at structures.
5. To Understand the Preparation of resistant building structures**.**

UNIT 1 INTRODUCTION TO DYNAMICS 9

Dynamics - Degree of freedom – Free and forced vibration - Idealization of structure as Single Degree of Freedom (SDOF) and Multi degree of freedom (MDOF) system – D'Alemberts Principles - Formulation of equation of motion for SDOF system and MDOF system –- Evaluation of natural frequencies and modes - Effect of damping.

UNIT 2 SEISMOLOGY 9

Elements of Engineering Seismology – Seismic hazard - Earthquake phenomenon – Seismotectonics – Seismic Instrumentation – Characteristics of Strong Earthquake motion – Estimation of Earthquake Parameters – Soil Structure Interaction – Liquefaction of soil - Seismic zone map – Response spectra.

UNIT 3 EARTHQUAKE EFFECTS ON STRUCTURES 9

Inertia force on structures – load transfer path – Effect of architectural features on behavior of structures – Hysteretic Behaviour of RCC, steel and prestressed concrete - Pinching Effect – Bouchinger Effects - Energy dissipation - P-delta effect - storey drift - Behavior of brick masonry, stone masonry and reinforced concrete structures under past earthquakes – typical failures - Causes of damage –- Lessons learnt from past earthquakes.

UNIT 4 EARTHQUAKE LOAD ANALYSIS 9

Design spectra – Codal provision – Different methods of earthquake analysis –- Analysis of structure by Equivalent static method – Analysis of structure by Response spectrum method – Introduction to time-history method of analysis

UNIT 5 EARTHQUAKE RESISTANT DESIGN 9

Philosophy of earthquake resistant design - Planning considerations and Architectural concepts - Design and detailing as per codal provisions - Design and detailing of typical flexural member and column member, Ductile detailing of beam-column joints and footing – Concept and principle of shear wall - Introduction to performance based seismic design - Seismic isolation principles and methods

COURSE OUTCOMES:

At the end of the course the student will able to

CO1 Plan a layout of a structure

CO2 Calculate loads using IS codes and various computational tools

CO3 Analyse the structure for various loads and load combination according to the relevant IS codes

CO4 Design and Analysis of structures using computer software/tools

CO5 Prepare the complete structural drawings using computer software

TEXBOOKS:

1. Mario Paz, Structural Dynamics – Theory and Computations, Fifth Edition 2nd printing, CBS publishers, 2006.
2. Agarwal.P and Shrikhande.M. Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2011.

REFERENCES:

1. Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, McGraw Hill International Edition, 1995.
2. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, Mc Graw – Hill Book Company, 1986.
3. Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering, Prentice Hall Inc., 2007.
4. Moorthy.C.V.R., Earthquake Tips, NICEE, IIT Kanpur,2002.

Publication of Bureau of Indian Standards:

a. IS 4326: 2013 Earthquake Resistant Design And Construction Of Buildings – Code of Practice

b. IS 1893: 2016 Criteria For Earthquake Resistant Design Of Structures – Part 1 General Provisions and Buildings.

c. IS 13920:2016 Ductile Design And Detailing Of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice.

TOTAL: 45 PERIODS

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	1	1	1	1	1	1	2	3	3	3
CO2	3	2	2	2	1	1	1	1	1	1	1	2	3	3	2
CO3	3	3	3	3	1	1	1	3	1	2	1	2	3	3	3
CO4	3	3	3	2	2	1	1	2	1	3	1	3	3	3	3
CO5	3	3	3	3	2	1	1	3	1	3	1	3	3	3	3
Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation															

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

VERTICAL II-CONSTRUCTION MANAGEMENT

U23CEP21 CONSTRUCTION TECHNIQUES AND PRACTICES Category:PEC

SDG: 9

L T P C
3 0 0 3

COURSE OBJECTIVE :

1. The main objective of this course is to make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities.
2. At the end of this course the student shall have a reasonable knowledge about the various construction procedures for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure**.**

UNIT 1 CONSTRUCTION TECHNIQUES 9

Structural systems - Load Bearing Structure - Framed Structure - Load transfer mechanism– floor system - Development of construction techniques - High rise Building Technology - Seismic effect - Environmental impact of materials – responsible sourcing - Eco Building (Green Building) - Material used - Construction methods - Natural Buildings - Passive buildings - Intelligent(Smart) buildings - Meaning - Building automation - Energy efficient buildings for various zones

UNIT 2 CONSTRUCTION PRACTICES 9

Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – constructio joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms– scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames braced domes– laying brick — weather and water proof – roof finishes – acoustic and fire protection

UNIT 3 SUB STRUCTURE CONSTRUCTION 9

Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement- Tunneling technique – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation

UNIT 4 SUPER STRUCTURE CONSTRUCTION 9

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure fo heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks**.**

UNIT 5 CONSTRUCTION EQUIPMENT 9

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching, mixing and concreting - Equipment for material handling and erection of structures – types of cranes - Equipment for dredging, trenching, tunneling

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1:Know the different construction techniques and structural systems

CO2:Understand various techniques and practices on masonry construction, flooring, and roofing. CO3:Plan the requirement for substructure construction.

CO4:Know the methods and techniques involved in the construction of various types of super structures

CO5:Select, maintain and operate hand and power tools and equipment used in the building construction sites.

TEXT BOOKS

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995
2. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpa Rai and Sons, 1997. 3. Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007

REFERENCE BOOKS

1. Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
2. Sharma S.C. “Construction Equipment and Management”, Khanna Publishers New Delhi, 2002.
3. Deodhar, S.V. “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi, 2012
4. Mahesh Varma, “Construction Equipment and its Planning and Application”, Metropolitan Book Company, New Delhi, 1983

TOTAL : 45 PERIODS

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	-	1	-	-	3	-	2	-	-	-	-	-	2	-	-
CO2	-	-	2	-	2	-	3	-	-	-	-	-	1	1	2
CO3	-	1	-	2	1	-	-	-	-	-		-	1	2	-
CO4	-	2	-	1	-	-	-	-	-	-	-	-	2	1	-
CO5	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs JK Sowmiya/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP22 CONSTRUCTION PLANNING AND SCHEDULING Category:PEC

SDG: 9 **L T P C**

3 0 0 3

COURSE OBJECTIVE :

To make the students to learn about planning of construction projects, scheduling procedures and techniques, cost and quality control projects and use of project information as decision making tool**.**

UNIT 1 CONSTRUCTION PLANNING 6

Basic concepts in the development of construction plans-Choice of Technology and Construction method- Defining Work Tasks- Work breakdown structure- Definition- Precedence relationships among activities- Estimating Activity Durations- Estimating Resource Requirements for work activities-coding systems

UNIT 2 SCHEDULING PROCEDURES AND TECHNIQUES 12

Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and

Windows-Calculations for scheduling with leads,lags and windows-Resource oriented scheduling-Scheduling with resource constraints and precedences -Use of Advanced Scheduling Techniques-Scheduling with uncertain durations- Crashing and time/cost tradeoffs-Improving the Scheduling process – Introduction to application software

UNIT 3 COST CONTROL MONITORING AND ACCOUNTING 9

The cost control problem-The project budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates- Relating cost and schedule information

UNIT 4 QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods -Statistical Quality control with Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety

UNIT 5 ORGANIZATION AND USE OF PROJECT INFORMATION 9

Types of project information-Accuracy and Use of Information-Computerized organization and use of Information - Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs- Information transfer and Flow.

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1: Understand basic concepts of construction planning. CO2: Schedule the construction activities

CO3: Forecast and control the cost in a construction

CO4: Understand the quality control and safety during construction

CO5: Organize information in Centralized database Management systems

TEXT BOOKS

1. Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2009
2. Srinath,L.S., “Pert and CPM Principles and Applications“, Affiliated East West Press, 2001

REFERENCE BOOKS

1. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners’ Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.

2. Moder.J., Phillips. C. and Davis E, “Project Management with CPM”, PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition, 1985.

3. Willis., E.M., “Scheduling Construction projects”, John Wiley and Sons, 1986. 4. Halpin,D.W., “Financial and Cost Concepts for Construction Management”, John Wiley and Sons, New York, 1985

CO’s-PO’s & PSO’s MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	2	1	1	1	2	2	3	2	2
CO2	3	3	3	2	3	1	2	1	2	2	3	2	3	3	1
CO3	3	3	2	2	2	1	2	1	2	2	3	2	3	3	2
CO4	2	2	2	2	2	2	3	3	2	2	2	2	2	2	2
CO5	2	2	2	2	3	1	2	1	2	3	3	3	2	3	2

Correlation levels: 1– low 2– medium 3 – high “-“-no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs JK Sowmiya/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP23 **BUILDING SERVICES** **Category:PEC**

SDG: 9 **L T P C**

3 0 0 3

COURSE OBJECTIVE :

1. The main objective of this course is to make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities.
2. At the end of this course the student shall have a reasonable knowledge about the various construction procedure for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure.

UNIT 1 CONSTRUCTION TECHNIQUES 9

Structural systems - Load Bearing Structure - Framed Structure - Load transfer mechanism– floor system

- Development of construction techniques - High rise Building Technology - Seismic effect - Environmental impact of materials – responsible sourcing - Eco Building (Green Building) - Material used - Construction methods - Natural Buildings - Passive buildings - Intelligent(Smart) buildings - Meaning - Building automation - Energy efficient buildings for various zones

UNIT 2 CONSTRUCTION PRACTICES 9

Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – constructio joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick — weather and water proof – roof finishes – acoustic and fire protection

UNIT 3 SUB STRUCTURE CONSTRUCTION 9

Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement- Tunneling technique – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation

UNIT 4 SUPER STRUCTURE CONSTRUCTION 9

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure fo heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks.

UNIT 5 CONSTRUCTION EQUIPMENT 9

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching,

mixing and concreting - Equipment for material handling and erection of structures – types of cranes - Equipment for dredging, trenching, tunneling

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1:Know the different construction techniques and structural systems

CO2:Understand various techniques and practices on masonry construction, flooring, and roofing.

CO3:Plan the requirements for substructure construction.

CO4:Know the methods and techniques involved in the construction of various types of super structures

CO5:Select, maintain and operate hand and power tools and equipment used in the building construction sites.

TEXT BOOKS

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995
2. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997. 3. Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007

REFERENCE BOOKS

1. Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
2. Sharma S.C. “Construction Equipment and Management”, Khanna Publishers New Delhi, 2002.
3. Deodhar, S.V. “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi, 2012
4. Mahesh Varma, “Construction Equipment and its Planning and Application”, Metropolitan Book Company, New Delhi, 1983

TOTAL : 45 PERIODS

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	-	1	-	-	3	-	2	-	-	-	-	-	2	-	-
CO2	-	-	2	-	2	-	3	-	-	-	-	-	1	1	2
CO3	-	1	-	2	1	-	-	-	-	-		-	1	2	-
CO4	-	2	-	1	-	-	-	-	-	-	-	-	2	1	-
CO5	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs JK Sowmiya/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP24 ADVANCED CONSTRUCTION TECHNIQUES Category:PEC

SDG: 9

L T P C
3 0 0 3

COURSE OBJECTIVE :

To study and understand the latest construction techniques applied to engineering construction for sub structure, super structure, special structures, rehabilitation and strengthening techniques and demolition techniques

UNIT 1 SUB STRUCTURE CONSTRUCTION 9

Construction Methodology - Box jacking - Pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - Piling techniques - Driving well and caisson - sinking cofferdam - cable anchoring and grouting - Driving diaphragm walls, Sheet piles - Laying operations for built up offshore system - Shoring for deep cutting - Large reservoir construction - well points - Dewatering for underground open excavation

UNIT 2 SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS 9

Vacuum dewatering of concrete flooring – Concrete paving technology – Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – Erection techniques of tall structures, Large span structures – launching techniques for heavy decks – in-situ prestressing in high rise structures, Post tensioning of slab- aerial transporting – Handling and erecting lightweight components on tall structures.

UNIT 3 CONSTRUCTION OF SPECIAL STRUCTURES 9

Erection of lattice towers - Rigging of transmission line structures – Construction sequence in cooling towers, Silos, chimney sky scrapers - Bow string bridges, Cable stayed bridges – Launching and pushing of box decks – Construction of jetties and break water structures – Construction sequence and methods in domes – Support structure for heavy equipment and machinery in heavy industries – Erection of articulated structures and space decks.

UNIT 4 REHABILITATION AND STRENGTHENING TECHNIQUES 9

Seismic retrofitting - Strengthening of beams - Strengthening of columns - Strengthening of slab - Strengthening of masonry wall, Protection methods of structures, Mud jacking and grouting for foundation – Micro piling and underpinning for strengthening floor and shallow profile - Sub grade water proofing, Soil Stabilization techniques

UNIT 5 DEMOLITION 9

Demolition Techniques, Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling.

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1: Understand the modern construction techniques used in the sub structure construction.

CO2: Demonstrate knowledge and understanding of the principles and concepts relevant to super structure construction for buildings

CO3: Understand the concepts used in the construction of special structures

CO4: Knowledge on Various strengthening and repair methods for different cases. CO5: Identify the suitable demolition technique for demolishing a building.sites.

TEXT BOOKS:

1. Jerry Irvine, Advanced Construction Techniques, CA Rocket, 1984
2. Patrick Powers. J., Construction Dewatering: New Methods and Applications, John Wiley & Sons, 1992.
3. Peter H.Emmons, “Concrete repair and maintenance illustrated”, Galgotia Publications Pvt. Ltd., 2001.Press, 2008.
4. Robertwade Brown, Practical foundation engineering hand book, McGraw Hill Publications, 1995.
5. Sankar, S.K. and Saraswati, S., Construction Technology, Oxford University, New Delhi, 2008

REFERENCES:

1. Jerry Irvine, Advanced Construction Techniques, CA Rocket, 1984
2. Patrick Powers. J., Construction Dewatering: New Methods and Applications, John Wiley & Sons, 1992.
3. Peter H.Emmons, “Concrete repair and maintenance illustrated”, Galgotia Publications Pvt. Ltd., 2001.Press, 2008.
4. Robertwade Brown, Practical foundation engineering hand book, McGraw Hill Publications, 1995.
5. Sankar, S.K. and Saraswati, S., Construction Technology, Oxford University, New Delhi, 2008

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	1	3	3	2	2	-	1	1	2	1	3	2	3
CO2	1	-	-	2	2	2	3	-	1	1	2	1	2	3	2
CO3	2	3	3	2	3	3	2	1	2	2	2	1	3	3	3
CO4	2	3	3	3	2	1	2	1	1	1	2	1	3	3	3
CO5	1	3	3	3	2	2	1	1	2	2	3	2	2	3	2

Correlation levels: **1– low** **2– medium** **3 – high** **"-"-no correlation**

COURSE DESIGNED BY	APPROVED BY
Mrs JK Sowmiya/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP25 **DIGITALIZED CONSTRUCTION LAB** **Category:PEC**

SDG: 9

L	T	P	C
0	0	6	3

COURSE OBJECTIVE :

To train the students in field of digitalization of construction. Students can be trained in the latest softwares relevant to construction industry

List of experiments:

1. To implement the digital knowledge in construction (use relevant softwares) 1.Introduction and understanding of Primavera project planner for construction
2. Using Primavera project planner, update the schedule of the project of a construction project.
3. Introduction and understanding of MS Project for a construction project
4. Using MS project, schedule the construction project planning
5. Introduction to BIM in construction projects a. Development of BIM for small construction project
6. Progress the work flows in construction project using BIM
7. Development of bid management for a small firm construction industry using software.

TOTAL: 90 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to understand the output of digitalization of construction CO1 To understand the importance of latest softwares in a construction industry.

CO2 To plan a construction project using Primervera CO3 To plan a construction project using MS project CO4 To develope BIM information model

CO5 To analyse the bid management and its effectiveness using bid management software

CO's-PO's & PSO's MAPPING															
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**	**2**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**3**
CO2	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**2**	**2**	**3**
CO3	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**2**
CO4	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**3**
CO5	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**3**
Correlation levels:			**1– low**				**2– medium**			**3 – high**		**"-"-no correlation**			

COURSE DESIGNED BY	**APPROVED BY**
Mrs JK Sowmiya/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CEP26 **FORM WORK ENGINEERING** **Category:PEC**

SDG: 9 **L T P C**

3 0 0 3

COURSE OBJECTIVE :

On completion of this course the students will be able to know the detailed planning of formwork, design of forms and erection of form work.

UNIT 1 INTRODUCTION TO FORM WORK 9

Introduction to Formwork and false work, Temporary work systems, Requirements, Construction planning and site constraints, Selection, and Classification (Types) of Formwork, General objectives of formwork building - Planning for safet - Development of a Basic System - Key Areas of cost reduction - Planning examples - Overall Planning - Detailed planning - Overall programme - Detailed programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant - Formwork beams - Scaffold frames - Framed panel formwork**.**

UNIT 2 FORMWORK MATERIALS ASSESORIES & PRESSURES 9

Formwork Materials, Accessories and consumables – Application of tools, Reconstituted wood - Steel – Aluminum Plywood Types and grades Standard units - Corner units – Pass units, Calculation of labour constants - Formwork hours - Labour Requirement. Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Finish - Sheathing boards working stresses - Repetitive member stress Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls

UNIT 3 FORMWORK DESIGN 9

Concepts, Formwork Systems – components, assembly, De-shuttering, safety of work and Design for Tall Structures, Foundation Wall, Column, Slab and Beam formworks. Design of Decks and False works. Effects of various loads. Loading and moment of formwork, IS Code provisions.

UNIT 4 FORMWORK FOR SPECIAL STRUCTURES 9

Formwork for Bridge Structures, Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Nuclea Reactor, Tunnel, Lift Shaft, stairs and Formwork for Precast Concrete. Various climbing system, Table lifting system

UNIT 5 CASE STUDIES 9

Formwork failures: Causes of failures – Inadequate shoring inadequate bracing of members – improper vibration – Prematur stripping Errors in design – Case studies – Finish of exposed concrete design deficiencies – Safety factors – Prevention of rotation – Stripping sequence – failure formwork issues in multi - story building construction – vertical and horizontal elements used in the industry.

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1 To understand the overall and detailed planning of formwork.

CO2: To impart knowledge on formwork materials, accessories, pressures and labour requirement. CO3: To develop the conceptual understanding of design, construction and erection of formwork. CO4: To impart the knowledge about different types of form work used for special structures.

CO5: To understand the errors in design and judge the formwork failures through case studies**.**

TEXT BOOKS

1. Peurify R.L and Oberlender G.D , Formwork for Concrete Structures, , McGraw Hill Education India ,2015

2. Jha K N, Formwork for Concrete Structures, Tata McGraw Hill Education, 2012.

REFERENCE BOOKS

1. Austin, C.K., Formwork for Concrete, Cleaver -Hume Press Ltd., London, 1996.

2. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996

3. Michael P. Hurst, Construction Press, London and New York, 2003.

4. Christopher Souder , (2014), Temporary Structure Design, Wiley Publications, London.

5. IS 14687: 1999, False work for Concrete Structures - Guidelines, BIS.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	-	1	-	-	3	-	2	-	-	-	-	-	2	-	-
CO2	-	-	2	-	2	-	3	-	-	-	-	-	1	1	2
CO3	-	1	-	2	1	-	-	-	-	-		-	1	2	-
CO4	-	2	-	1	-	-	-	-	-	-	-	-	2	1	-
CO5	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs JK Sowmiya/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CEP27 QUALITY CONTROL AND ASSURANCE Category:PEC

SDG: 9

L T P C
3 0 0 3

COURSE OBJECTIVE :

1. To study the concepts of quality management in construction.
2. To study the concepts of quality systems.
3. To study the concepts of quality planning.
4. To study the concepts of quality assurance and control techniques in construction.
5. To study the concepts of quality improvement techniques.

UNIT 1 QUALITY MANAGEMENT 9

Introduction – Definitions and objectives – Dimensions of quality - Factors influencing construction quality – Responsibilitie and authority – Methods to improve quality – Quality Process - Quality plan – Quality Management Guidelines – Quality circles.

UNIT 2 QUALITY SYSTEMS 9

Introduction – History of standards - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third-party Certification – Emissio Norms – BS Norms.

NIT 3 QUALITY PLANNING 9

Quality Policy, Objectives and methods in the Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – TQM – Traditional approach vs. Modern approach – Principles of TQM - Taguchi's concept of quality – Quality function deployment - Codes and Standards – Documents – Contract and construction programming – Inspection procedures - Processes and products – Total QA / QC programme and cost implication

UNIT 4 QUALITY ASSURANCE AND CONTROL 9

Objectives – Regularity agent, owner, design, contract, and construction-oriented objectives, methods – Techniques and need of QA/QC – Different aspects of quality – Appraisals – Sampling techniques – Sampling plan – Sampling Terms – AQL, LTPD, AOL - Factors influencing construction quality – Critical, major failure aspects and failure mode analysis, – Stability methods and tools, optimum design – Reliability testing, reliability coefficient and reliability prediction – Failure rate – Mea time to failure – Mean time to repair – Mean time between failures.

UNIT 5 QUALITY IMPROVEMENT TECHNIQUES 9

Selection of new materials – Influence of drawings, detailing specification, standardization – Bid preparation – Construction activity, environmental safety, social and environmental factors – Natural causes and speed of construction – Life cycle costing – Kaizen - Value engineering and value analysis

.

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1: Describe the basics of quality management guidelines, and quality circles. CO2: Elaborate the quality standards for preparing quality system documents. CO3: Assimilate the different quality systems and techniques.

CO4: Apply the techniques and tools for quality assurance and control in construction industry.

CO5: Achieve the improvement in quality through different technique.

TEXT BOOKS

1 Hutchins. G, ISO 9000: A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification Oliver Wight Publications, 1993.

2 James, J.O' Brian, Construction Inspection Handbook – TQM, Van Nostrand, Springer, 2012.

3KB Rajoria, Deepak Naryan, Deepak Gupta, ISO 9000 Practices in construction, CBS Publishers 2022

REFERENCE BOOKS

1. Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, McGraw Hill, 2001.

2. Steven McCabe, Quality Improvement Techniques in Construction, CRC Press, 2014.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	1	-	2	3	2	1
CO2	3	3	2	-	1	-	-	-	-	1	-	2	3	3	2
CO3	3	2	3	2	1	-	-	-	1	2	-	3	3	3	3
CO4	3	3	3	2	2	-	-	-	-	1	-	3	3	2	3
CO5	3	2	3	3	2	-	2	2	1	2	2	3	3	3	3

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs JK Sowmiya/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

VERTICAL III:GEOTECHNICAL ENGINEERING

Category:PCC

U23CEP31	**PILE FOUNDATION**	**L T P C**
SDG 9		**3 0 0 3**

COURSE OBJECTIVE :

The student will be exposed to the design of piles, pile groups and caissons with respect to vertical and lateral loads for various field conditions.

UNIT 1 PILE CLASSIFICATIONS AND LOAD TRANSFER PRINCIPLE **9**

Necessity of pile foundation – classification of piles – Factors governing choice of type of pile – Load transfer mechanism – piling equipments and methods – effect of pile installation on soil condition – pile raft system – basic interactive analysis - criteria for pile socketing.

UNIT 2 AXIAL LOAD CAPACITY OF PILES AND PILE GROUPS **9**

Allowable load of piles and pile groups – Static and dynamic methods – for cohesive and cohesionless soil – negative skin friction – group efficiency – pile driving formulae - limitation – Wave equation application – evaluation of axial load capacity from field test results - Settlement of piles and pile group

UNIT 3 LATERAL AND UPLIFT LOAD CAPACITIES OF PILES **9**

Piles under Lateral loads – Broms method, elastic, p-y curve analyses – Batter piles – response to moment – piles under uplift loads – under reamed piles – Drilled shaft – Lateral and pull out capacity from load test.

UNIT 4 STRUCTURAL DESIGN OF PILE AND PILE GROUPS **9**

Structural design of pile – structural capacity – pile and pile cap connection – pile cap design – shape, depth, assessment and amount of steel – truss and bending theory- Reinforcement details of pile and pile caps — pile subjected to vibration.

UNIT 5 CAISSONS **9**

Necessity of caisson – type and shape - Stability of caissons – principles of analysis and design – tilting of caisson – construction - seismic influences

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 Explain the importance of pile foundation and various functions and responsibilities of geotechnical engineer and contractor, in addition to the piling equipments.

2 Determine the vertical load carrying capacity of pile and pile group- keeping the settlement of pile as an important criteria based on field practices and codal provisions

3	Apart from vertically loaded piles, the structures are exposed to the peculiar pile subjected to lateral and uplift load with reference to codal provision and case studies.
4	Understand the design of pile and pile caps, considering the wind and seismic load
5	Explain the importance of caisson foundation and checking the stability of caissons based on codal provisions.

TEXT BOOKS

1. Das, B.M., Principles of Foundation Engineering, Design and Construction, Fourth Edition, PWS Publishing, 1999.
2. Poulos, H.G., Davis, E.H., Pile foundation analysis and design, John Wiley and Sons, New York, 1980

REFERENCE BOOKS

1. Varghese P.C.," Foundation Engineering", PHI Learning Private Limited, New Delhi, 2005.
2. Varghese P.C.," Design of Reinforced Concrete Foundations", PHI Learning Private Limited, New Delhi, 2009.
3. Tomlinson, M.J. Foundation engineering, ELBS, Longman Group, U.K. Ltd., England 1995.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	1	1	3	2	1	1	1	2	2	1	3	3	2	2
CO2	2	3	3	1	1		1	1	1	1	1	3	2	1	3
CO3	2	3	3	2	2	1	1	1	1	1		3	3	2	3
CO4	1	3	3	2	2		1	1	1	1	1	3	2	1	2
CO5	2	3	2	2	2	1	1	1	1	1	1	3	3	2	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category:PCC

U23CEP32	**TUNNELING ENGINEERING**	**L T P C**
SDG 9		**3 0 0 3**

COURSE OBJECTIVE :

1. Students mainly focused in visualizing and critically analyzing the behavior of underground structures with reference to various supporting systems under different loading conditions due to induced earth pressure on the underground structures.
2. To give idea about the equipment used in underground excavations

UNIT 1 TUNNELS AND UNDERGROUND SPACE APPLICATION 9

History-caves-tunnels for transport- water, power supply-storage of LPG –nuclear waste disposal - defense facilities-submerged tunnels-underground library, museums.

UNIT 2 EXCAVATION TECHNIQUES 9

Types and purpose of tunnels-choice of excavation methods-soft ground tunneling-hard rock tunneling-tunnel drilling-blasting-impact hammers-problems encountered and remedial measures.

UNIT 3 PLANNING AND GEOMETRIC DESIGN OF TUNNELS 9

Topographical –geological survey-rock sampling-testing-determination of location size shape and alignment-subsidence problem on soft ground –tunneling design in hard rock.

UNIT 4 CONSTRUCTION OF TUNNEL 9

Advanced drilling techniques –TBM-cuttability assessment-shield tunneling-advantages-types of shield tunneling-factors affecting selection of shield-twin tunnel-NATM.

UNIT 5 DESIGN OF TUNNEL SUPPORTING SYSTEMS AND VENTILATION 9

Classification of supports-active –passive-permanent-temporary-excavation support-steel supports- lining-grouting-ground freezing-environment in underground-various methods of ventilation.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1	To Understand need of utilization of underground space for various applications.
2	To study various methods of excavations and tunneling methods.
3	Planning and design process of tunnels.
4	To identify the suitable method of tunneling.
5	To study various types of support system and its merit and demerits.

TEXT BOOKS

1. Underground infrastructure planning design construction-R.K.Goel, Bhavani singh, Jian Zhao, Butterworth heinemunn publishers.
2. Practical tunnel construction, Hemphill G.B 2012 Johnwileyand Son

REFERENCE BOOKS

Introduction to tunnel construction, David chapran, Nicole metse and Alfred stark,Spor press.

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	1	1	1	2		1	1			2	2	3	2
CO2	2	3	1		1							2	2	3	3
CO3	2	2	3		1							2	2	3	3
CO4	2	2	3	1	1							2	2	3	3
CO5	2	2	2	1		1	1			1	1	2	2	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

Category:PEC

U23CEP33 ROCK MECHANICS L T P C

SDG 9 3 0 0 3

COURSE OBJECTIVE :

Students are expected to classify, understand stress-strain characteristics, failure criteria, and influence of in-situ stress in the stability of various structures and various technique to improve the in-situ strength of rocks

UNIT 1 CLASSIFICATION OF ROCKS 9

Types of Rocks - Index properties and classification of rock masses, competent and incompetent rock - value of RMR and ratings in field estimations.

UNIT 2 STRENGTH CRITERIA OF ROCKS 9

Behaviour of rock under hydrostatic compression and deviatric loading - Modes of rock failure planes of weakness and joint characteristics - joint testing, Mohr - Coulomb failure criterion and

tension cut- off. Hoek and Brown Strength criteria for rocks with discontinuity sets

UNIT 3 INSITU STRESSES IN ROCKS 9

In-situ stresses and their measurements, Hydraulic fracturing, flat jack, over coring and under coring methods - stress around underground excavations – Design aspects of openings in rocks

UNIT 4 SLOPE STABILITY AND BEARING CAPACITY OF ROCKS 9

Rock slopes - role of discontinuities in slop failure, slope analysis and factor of safety - remedial measures for critical slopes – Bearing capacity of foundations on rocks.

UNIT 5 ROCK STABILIZATION 9

Stabilization of rocks-rock support and rock reinforcement-active and passive supports-ground response curve-support reaction curve-reinforcement of fractured and joined rocks-Shotcreting-bolting-anchoring-installation methods.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 Classify the Rock mass and rate the quality of rock for tunnelling and foundations works and suggest the safer length of tunnelling and stand-up time.

2 Apply the knowledge of engineering and understand the stress – strain characteristics and failure criteria of rock and apply them to arrive at the shear strength parameters of rocks to be used for the design of structures resting on rock and also for the design of underground excavation in rocks.

3 Apply the knowledge of engineering and assess the influence of in-situ stress in the stability of various underground excavations and also acquire the knowledge of design of opening in rocks.

4 Apply the knowledge on rock mechanics and analyze the stability of rock slopes and arrive at the bearing capacity of shallow and deep foundations resting on rocks considering the presence of joints. design the foundations resting on rocks. Able to carry-out suitable foundation for the structure resting on rock.

5 Improve the in-situ strength of rocks by various methods such as rock reinforcement and rock support. Able to select suitable support system considering the interaction between rock and support. Also capable of executing the same in the field.

TEXT BOOKS

1. Goodman, R.E., Introduction to rock mechanics, John Willey and Sons, 1989
2. Hudson, A. and Harrison, P., Engineering Rock mechanics – An introduction to the principles, Pergamon publications, 1997.

REFERENCE BOOKS

1.Hoek, E and Bray, J., Rock slope Engineering, Institute of Mining and Metallurgy, U.K.1981.
2.Obvert, L. and Duvall, W., Rock Mechanics and the Design of structures in Rock, John Wiley, 1967.
3.Waltham, T, Foundations of Engineering Geology, Second Edition, Spon Press,
4. Taylor & Francis Group, London and New York, 2002.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	2	3	1	2	1	3	2	1	2	3	3	2	2
CO2	3	3	3	2	3	2	2	1	2	1	2	3	3	2	2
CO3	3	3	3	3	2	3	2	1	2	2	3	3	3	2	3
CO4	3	3	3	2	3	3	3	1	3	2	3	3	3	3	3
CO5	2	2	3	1	3	3	3	3	3	1	3	3	3	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

Category:PEC

U23CEP34	**GEOENVIRONMENTAL ENGINEERING**	**L T P C**
SDG 9		3 0 0 3

COURSE OBJECTIVE :

The student acquires the knowledge on the Geotechnical engineering problems associated with soil contamination, safe disposal of waste and remediate the contaminated soils by different techniques hereby protecting environment

UNIT 1 SOIL – WASTE INTERACTION 9

Role of Geo-environmental Engineering – sources, generation and classification of wastes – causes and consequences of soil pollution – case studies in soil failure -factors influencing soil pollutant interaction – modification of index, chemical and engineering properties – physical and physio- chemical mechanisms

UNIT 2 CONTAMINANT TRANSPORT AND SITE CHARACTERISATION 9

Transport of contaminant in subsurface – advection, diffusion, dispersion – chemical process – biological process, sorption, desorption, precipitation, dissolution, oxidation, complexation, ion exchange, Volatization, biodegradation – characterization of contaminated sites – soil and rock data – hydrological and chemical data – analysis and evaluation.

UNIT 3 WASTE CONTAINMENT AND REMEDIATION OF CONTAMINATED SITES 9

In-situ containment – vertical and horizontal barrier – surface cover – ground water pumping system on subsurface drain – soil remediation – Soil Vapour extraction, soil waste stabilization, solidification of soils, electro kinetic remediation, soil heating, vitrification, bio remediation, Phytol-remediation – ground water remediation – pump and treat , In-situ flushing, permeable reacting barrier, In-situ air sparging.

UNIT 4 LANDFILLS AND SURFACE IMPOUNDMENTS 9

system – Source and characteristics of waste - site selection for landfills – components of landfills – liner soil, geomembrane, geosynthetic clay, geo-composite liner system – leachate collection – final cover design – monitoring landfill - Environmental laws and regulations.

UNIT 5 STABILISATION OF WASTE 9

Evaluation of waste materials – fly ash, municipal sludge, plastics, scrap tire, blast furnace slag, construction waste, wood waste and their physical, chemical and biological characteristics – potential reuse – utilization of waste and soil stabilization

.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 Understand the various causes and consequences of waste interaction with soil and their modification

2 Understand the various mechanism of transport of contaminants into the subsurface and characterization of contaminated sites and their risk analysis

3 Understand on how to decontaminate the site so as to reuse the site for human settlement

4 Understand how to safely dispose the waste through different containment process.

5 Expose on how to convert the waste into a resource material through soil waste stabilization techniques with or without chemical stabilization

TEXT BOOKS

1. Daniel B.E, Geotechnical Practice for waste disposal, Chapman & Hall, London, 1993.
2. Hari D. Sharma and Krishna R.Reddy, Geo-Environmental Engineering – John Wiley and Sons, INC, USA, 2004.

REFERENCE BOOKS

1. Westlake, K., Landfill Waste pollution and Control, Albion Publishing Ltd., England, 1995
2. Wentz, C.A., Hazardous Waste Management, McGraw Hill, Singapore, 1989.
3. Lagrega, M.d., Buckingham, P.L., and Evans, J.C., Hazardous Waste Management, McGraw Hill, Inc. Singapore, 1994

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	1	1	1	2	2	3				1	3	2	2	3
CO2	3	1			2	2	3		2			3	2	2	3
CO3	2	1	2	2	1	3	3	2	2	2		3	2	2	2
CO4	1	3	3	2		2	3	2	2	2	1	3	3	2	3
CO5	1	1	2	2	1	2	3	2	3	2	1	3	1	2	2

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

Category:PEC

U23CEP35 EARTH AND EARTH RETAINING STRUCTURES L T P C

SDG 9 3 0 0 3

COURSE OBJECTIVE :

At the end of this course, students are expected to analyse and design rigid, flexible earth retaining structures, slurry supported trenches and deep cuts.

UNIT 1 EARTH PRESSURE THEORIES 9

Introduction – State of stress in retained soil mass – Earth pressure theories – Classical and graphical techniques (Culmann's method) – Active and passive cases – Earth pressure due to external loads

UNIT 2 COMPACTION, DRAINAGE AND STABILITY OF RETAINING STRUCTURES 9

Retaining structure – Selection of soil parameters - Lateral pressure due to compaction, strain softening, wall flexibility, drainage arrangements and its influence. – Stability analysis of retaining structure both for regular and earthquake forces.

UNIT 3 SHEET PILE WALLS 9

Types of sheet piles - Analysis and design of cantilever and anchored sheet pile walls – free earth support method – fixed earth support method. Design of anchor systems - isolated and continuous

UNIT 4 SUPPORTED EXCAVATIONS 9

Lateral pressure on sheeting in braced excavation, stability against piping and bottom heaving. Earth pressure around tunnel lining, shaft and silos – Soil anchors – Soil pinning –Basic design concepts

UNIT 5 SLURRY SUPPORTED EXACAVATION 9

Slurry supported trenches-basic principles-slurry characteristics-specifications-diaphragm walls-bored pile walls-contiguous pile wall-secant piles-stability analysis.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 Analyse the earth pressure acting on retaining structures by applying classical theories considering all influencing parameters and suggest the earth pressure to be considered for the design of retaining structures.

2 Apply the knowledge of engineering and earth pressure to analyse and design rigid retaining structures considering effect of compaction, wall flexibility, pore water pressure and earth quake forces.

3 Apply the knowledge of engineering and earth pressure to analyse and design flexible earth retaining walls and also acquire the knowledge of design of anchors

4 Apply the knowledge on lateral earth pressure behind and around excavation to analyse and design braced excavations, slurry supported excavations and underground utilities.

5 To understand the role of slurry in supporting excavations and to perform stability analysis by considering the actual shape of slurry support

TEXT BOOKS

1. Clayton, C.R.I., Militisky, J. and Woods, R.I., Earth pressure and Earth-Retaining structures, Second Edition, Survey University Press, 1993.
2. Das, B.M., Principles of Geotechnical Engineering, Fourth Edition, The PWS series in Civil Engineering, 1998.

REFERENCE BOOKS

3. Militisky, J. and Woods, R., Earth and Earth retaining structures, Routledge,1992
4. Koerner, R.M. Designing with Geosynthetics, Third Edition, Prentice Hall, 1997.
5. Winterkorn, H.F. and Fang, H.Y., Foundation Engineering Handbook, Galgotia Book source, 2000.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO2	2	2	3	3	3	2	1	1	2	1	3	3	2	2	2
CO3	2	2	3	3	3	2	1	1	2	2	3	3	2	2	2
CO4	3	3	3	1	3	3	1	1	1	2	3	3	3	3	3
CO5	3	3	3	3	3	3	2	2	2	2	3	3	2	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

Category:PEC

U23CEP36	**GROUND IMPROVEMENT TECHNIQUES**	**L T P C**
SDG 9		3 0 0 3

COURSE OBJECTIVE :

Students will be exposed to various problems associated with soil deposits and methods to evaluate them. The different techniques will be taught to them to improve the characteristics of difficult soils as well as design techniques required to implement various ground improvement methods.

UNIT 1 HYDRAULIC MODIFICATIONS 9

Scope and necessity of ground improvement in Geotechnical engineering basic concepts. Drainage – Ground Water lowering by well points, deep wells, vacuum and electro-osmotic methods. Stabilization by thermal and freezing techniques - Applications.

UNIT 2 MECHANICAL MODIFICATIONS 9

Insitu compaction of granular and cohesive soils, Shallow and Deep compaction methods – Sand piles – Concept, design, factors influencing compaction. Blasting and dynamic consolidation design and relative merits of various methods – Soil liquefaction mitigation methods.

UNIT 3 PHYSICAL MODIFICATION 9

Preloading with sand drains, fabric drains, wick drains – theories of sand drain - Stone column with and without encased, lime stone – functions – methods of installation – design, estimation of load carrying capacity and settlement. Root piles and soil nailing – methods of installation – Design and Applications

UNIT 4 MODIFICATION BY INCLUSIONS 9

Reinforcement – Principles and basic mechanism of reinforced earth, simple design: Synthetic and natural fiber based Geotextiles and their applications. Filtration, drainage, separation, erosion control

UNIT 5 CHEMICAL MODIFICATION 9

Grouting – Types of grout – Suspension and solution grouts – Basic requirements of grout. Grouting equipment – injection methods – jet grouting – grout monitoring – Electro – Chemical stabilization – Stabilization with cement, lime - Stabilization of expansive clays.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1	Identify and evaluate the deficiencies in the deposits of the given project area and improve its characteristics by hydraulic modifications
2	Improve the ground characteristics by mechanical modifications using various method and design the system
3	improve the ground characteristics by physical modifications using various method and design the system

4	improve the characteristics of soils by various reinforcement techniques and design
5	Analyse the ground and decide the suitable chemical method for improving its characteristics

TEXT BOOKS

1. Pappala, A.J.,Huang,J., Han, J., and Hoyos, L.R., Ground Improvement and Geosynthetics; Geotechnical special publication No.207, Geo Institute, ASCE, 2010
2. Han,J., Principles and Practice of Ground Improvement, John Wiley and Sons, New Jersey, Canada 2015.

REFERENCE BOOKS

1. Cox, B.R., and Grifiths S.C., Practical Recommendation for Evaluation and mitigation of Soil Liquefaction in Arkansas, (Project Report), 2010.
2. Rowe, R.K., Geotechnical and Geo-environmental Engineering Handbook, Kluwer Academic Publishers, 2001
3. Koerner, R.M., Designing with Geosynthetics, Third Edition, Prentice Hall 1997

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	2	3	1	3	3	3	3	3	2	3	3	3	2
CO2	2	3	3	2	3	2	2	1	2	2	1	3	3	3	3
CO3	2	3	3	2	3	3	2	1	2	1	1	3	3	3	3
CO4	2	3	3	1	3	2	2	1	2	1	1	3	3	3	3
CO5	2	3	2	2	1	2	2	1	2	1	1	3	3	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category:PEC

U23CEP37 SOIL DYNAMICS AND MACHINE FOUNDATIONS L T P C

SDG 9 3 0 0 3

COURSE OBJECTIVE :

To design different types of machine foundations based on the dynamic properties of soils and to get an exposure on vibration isolation techniques

UNIT 1 THEORY OF VIBRATION 9

Introduction – Nature of dynamic loads – Basic definitions – Simple harmonic motion – Fundamentals of vibration – Single degree and multi degree of freedom systems – Free vibrations of spring – Mass systems – Forced vibrations – Resonance – Viscous damping – Principles of vibrations measuring systems – Effect of transient and pulsating loads.

UNIT 2 DYNAMIC SOIL PROPERTIES 9

Dynamic stress-strain characteristics – Principles of measuring dynamic properties – Laboratory techniques – Field tests – Block vibration test – Factors affecting dynamic properties – Typical values. Mechanism of liquefaction – Influencing factors – Evaluation of liquefaction potential – Analysis from SPT test – Dynamic bearing capacity – Dynamic earth pressure

UNIT 3 MACHINE FOUNDATIONS 9

Introduction – Types of machine foundations – General requirements for design of machine foundations – Design approach for machine foundation – Vibration analysis – Elastic Half-Space theory – Mass-spring-dashpot model – Permissible amplitudes – Permissible bearing pressures

UNIT 4 DESIGN OF MACHINE FOUNDATION 9

Evaluation of design parameters – Types of Machines and foundations – General requirements – their importance – Analysis and design of block type and framed type machine foundations – Modes of vibration of a rigid foundation – Foundations for reciprocating machines, impact machines, Two – Cylinder vertical compressor, Double-acting steam hammer –Codal recommendations - Empirical approach – Barken's method – Bulb of pressure concept – Pauw's analogy – Vibration table studies.

UNIT 5 VIBRATION ISOLATION 9

Vibration isolation – Types of isolation – Transmissibility – Passive and active isolation – Methods of isolation – Use of springs and damping materials – Properties of isolating materials – Vibration control of existing machine foundation

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 Acquire knowledge to apply theories of vibration to solve dynamic soil problems

2 Evaluate the dynamic properties of soil using laboratory and field tests

3 Acquire basic knowledge about machine foundations and design various types of machine foundation.

4 To know and capable of selecting the types of vibration isolation materials.

5 To apply vibration isolation techniques for various field problems.

TEXT BOOKS

1. KameswaraRao, N.S.V., Dynamics soil tests and applications, Wheeler Publishing, New Delhi, 2000.
2. Prakash, S and Puri, V.K., Foundations for machines, McGraw Hill, 1987.

REFERENCE BOOKS

1. Moore, P.J.,Analysis and Design of Foundations for Vibrations, Oxford and IBH, 1985.
2. Vaidyanathan, C.V., and Srinivasalu, P., Handbook of Machine Foundations, McGraw Hill, 1995
3. Arya, S., O'Nelt; S., Design of Structures and Foundations for Vibrating Machines, Prentice Hall, 1981.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	1	1	1	2	2	1	1	1	1	3	2	2	2
CO2	2	2	2	3	2	2	1	2	2	1	1	3	2	2	2
CO3	2	3	3	3	2	3	2	3	2			3	3	3	3
CO4	2	3	3	3	2	3	2	3	2	1		3	3	3	3
CO5	2	3	3	3		3	3	3	2	1	1	3	3	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

VERTICAL IV:TRANSPORTATION ENGINEERING

Category PEC

U23CEP41	**URBAN PLANNING AND DEVELOPMENT**	**L T P C**
SDG 9		**3 0 0 3**

COURSE OBJECTIVE :

To enable students to have the knowledge on planning process and to introduce to the students about the regulations and laws related to Urban Planning.

UNIT 1 INTRODUCTION 9

Definition of Human settlement, Urban area, Town, City, Metropolitan City, Megalopolis, Urbanization, Urbanism, Suburbanization, Urban sprawl, Peril-urban areas, Central Business District (CBD), Urban Agglomeration, Census definition of urban settlements, Classification of urban areas –Positive and negative impacts of urbanization, - Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

UNIT 2 PLANNING PROCESS AND THEORIES 9

Principles of Planning –Stages in Planning Process – Goals, Objectives, Delineation of Planning Areas, Draft Plans, Evaluation, Final Plan. Planning Theories - Garden City Concept, Geddesian Triad by Patrick Geddes, Modernism Concept by Le-Corbusier, Redburn Concept, Neighborhoods, Theories of Ekistics, Bid-rent Theory by William Alonso, Green Belt Concept

UNIT 3 DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION 9

Types of plans – Regional Plan, Master Plan, Structure Plan, Detailed Development Plan, New Town/ Satellite town- Development Plan, urban nodes, Smart City Plan -Scope and Content of Regional Plan (RP), Master Plan (MP), and the Detailed Development Plan (DDP), Methodologies for the preparation of the RP, MP, and the DDP – Case Studies.

UNIT 4 PLAN IMPLEMENTATION 9

Planning Standards, Project Formulation and evaluation; Project Report preparation and presentation; Legal, Financial and Institutional constraints – Problems due to multiple laws, rules and institutions; Financing of Urban Development Projects; Urban planning agencies and their functions in the plan formulation and implementation.

UNIT 5 URBAN AND REGIONAL PLANNING LEGISLATIONS, REGULATIONS AND DESIGNS 9

Town and Country Planning, Local Bodies and Land Acquisition Acts, Development and Building Rules, Site analyses, Layouts and Buildings Design

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 Understand the basic issues and meaning of terminologies in urban planning

2	Understand the different types of theories of urban planning and city development.
3	Understand the different types of plan, their strategies and their preparation process.
4	Comprehend the planning standards, evaluate the constraints and the financial mechanism
5	Knowledge on various town and country planning acts and their functions.

TEXT BOOKS

1. Goel, S.L Urban Development and Management, Deep and Deep publications, New Delhi 2002
2. George Chadwick, A Systems view of planning, Pergamon press, Oxford 1978

REFERENCE BOOKS

1. Tamil Nadu Town and Country Planning Act 1971, and Rules made thereunder, Government of Tamil Nadu, Chennai
2. Thooyavan, K.R., Human Settlements – A Planning Guide to Beginners, M.A Publications, Chennai, 2005
3. Chennai City Municipal Corporation Act, 1919 and Tamil Nadu District Municipalities Act, 1920

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3					3	3		3		3		3	2	3
CO2	2		3	2		3	2	2	2		3	2	3	3	2
CO3	3		3			2	3		2	2	2	1	2	2	3
CO4			2	2	2		2	2	3		3	2	2	1	2
CO5	3	2	1	2		3	2	2	2	2	3	2	1	1	2

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category PEC

U23CEP42	TRAFFIC ENGINEERING AND MANAGEMENT	L T P C
SDG 9		3 0 0 3

COURSE OBJECTIVE :

To give an overview of Traffic engineering, various surveys to be conducted, traffic Regulation, management and traffic safety

UNIT 1 TRAFFIC SURVEYS AND ANALYSES 9

Traffic characteristics: Human, vehicular, and Pavement Characteristics, Problems- presentation of traffic volume data, Annual Average Daily Traffic, Average Daily Traffic, Design hourly traffic volume; Speed- spot speed, presentation of spot speed data, speed and delay studies, methods of conducting spot-speed studies and Speed and Delay studies; Problems Origin and Destination – methods of conducting the survey and presentation of data; parking surveys, presentation of data and analyses, determination of parking demand; Accident studies and analyses; Different problems.

UNIT 2 TRAFFIC FLOW AND ROADWAY CAPACITY 9

Traffic Flow Characteristics – Basic traffic manoeuvres, Traffic stream flow characteristics, Speed- Flow- Density Relations; Passenger Car Units – Mixed traffic flow and related issues – Concept of PCU value- Factors affecting PCU values- Recommended PCU values for different conditions; Capacity and Level of Service – Factors affecting practical capacity – Design Service Volumes

UNIT 3 COST – EFFECTIVE TRAFFIC MANAGEMENT TECHNIQUES 9

Traffic System Management: Regulatory Techniques- one way street, Reversible Street, Reversible lane, Turning moment restrictions, closing streets; Traffic Control Devices – Traffic Signs – Road Markings, Traffic Signals, Miscellaneous traffic control devices; Traffic Segregation – Vehicle segregation, Pedestrian segregation, Traffic signals design; Bus Priority Techniques – Priority manoeuvres – With-flow bus lane and contra-flow bus lane; Self- Enforcing Techniques- Demand Management Techniques (TDM) Road pricing, parking control, Tolls, Staggering of office/educational institution hours

UNIT 4 DESIGN OF ROAD INTERSECTIONS 9

Importance and Classification; Intersections at-grade – uncontrolled, channelised; Rotary intersections (problems)- Signalized intersections (problems)- Grade Separated Intersections – merits and demerits, types, pattern of intersections with different types of interchanges- Capacity, Concept diagrams.

UNIT 5 DESIGN OF PARKING AND PEDESTRIAN FACILITIES AND CYCLE TRACKS 9

Parking: Need for parking studies and its ill effects- Parking Standards for different land uses, different types of parking - Conceptual plans for different types of parking; Pedestrians: Importance, Barriers, Behaviour, Pedestrian facilities – Principles of planning, Level of Service (LoS), Design standards.; Cycle Tracks: Principles of design, Design criteria, Design standards for Rural Expressways.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 Apply the knowledge of science and engineering fundamentals in conducting traffic surveys, analyze the problems and relating it with standards

2	Understand the principles of traffic flow characteristics and their relationships
3	Understand various traffic management measures in addressing the demand Pricing and ITS applications.
4	Designing various types of control and regulatory measures to meet an efficient traffic network.
5	Understand various type of facilities and plan for Non Motorised Transport

TEXT BOOKS

1. Kadiyali. L.R. Traffic Engineering and Transport Planning, Khanna Publishers, Delhi, 2019.
2. Khanna .K and Justo C.E.G. and Veeraragavan, A Highway Engineering, Nem Chand Bros., Roorkee, Revised 10th Edition, 2014.

REFERENCE BOOKS

1. Indian Roads Congress (IRC) Specifications: Guidelines and special publications on Traffic Planning and Management.
2. Khanna S. K, and others, Highway Engineering, Nam Chand & Bros, Roorkee, 2014, Pages 177 – 308.
3. C. JotinKhisty, Kent Lall, Transportation Engineering: An Introduction, Prentice Hall, 1998

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	2	1	1	1	1	2	2	3	1	3	3	3
CO2	3	3	3	3	3	2	1	2	3		3	1	3	2	3
CO3	3	2	3	2	1	1	1	2	2	3	2	1	2	2	2
CO4	2	3	3	3	3	2	2	2	2	3	3	1	2	3	3
CO5	2	2	1	1	1	2	3	3	1	1	2	1	2	2	2

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category : PEC

U23CEP43	**TRANSPORTATION ENGINEERING**	**L T P C**
SDG 9		**3 0 0 3**

COURSE OBJECTIVE :

The main objective of this course is to give broad insight into the different facets of transportation systems, while providing a solid introduction to transportation demand and cost analyses.

UNIT 1 Introduction to Transportation Systems and Planning **9**

Overview of transportation systems - Importance and role of transportation in society - Social and economic impacts of transportation - Need and objectives of transportation planning

UNIT 2 Transportation Planning Process and Data Collection **9**

Components of transportation systems - Transportation planning process - Transportation costs and influencing factors - Transportation data requirements and survey methods - Transportation demand estimation

UNIT 3 Transportation System Analysis and Modeling **9**

Transportation supply and decision-making concepts - Sequential transportation system planning - Trip generation - trip distribution - modal split - traffic assignment models

UNIT 4 Land Use and Urban Transportation Planning **9**

Land use transportation planning - Urban Forms - Mobility –Activity - Hierarchy - Lowery's model etc.

UNIT 5 Travel Demand Management and Case Studies **9**

Travel demand management (TDM) measures - Strategies for sustainable transport systems - Review and analysis of practical case studies

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 Learn the fundamentals of transportation planning.

2 Understand the classical methods of urban transportation planning.

3 Acquainted with the transportation land use interaction.

4 Plan the rural road network.

5 Justify the geometric design standards adopted for low volume Roads.

TEXT BOOKS

1. J. de D. Ortuzar and L.G. Willumsen, Modelling Transport, John Wiley and Sons, 2001.
2. C.J. Khisty and B.K. Lall, Transportation Engineering – An Introduction, Prentice Hall of India Pvt. Ltd., 2002.

REFERENCE BOOKS

1. C. S. Papacostas and P. D. Prevedouros, Transportation Engineering and Planning, Prentice Hall of India Pvt. Ltd., 2001.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2				2	2						3		2
CO2	3	3	2		2								3	3	
CO3		2	2			2	3							3	3
CO4	3		3		2						2		3		3
CO5	3	2	2				2					2	3	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category PEC

U23CEP44	**PAVEMENT ENGINEERING**	**L T P C**
SDG 9		**3 0 0 3**

COURSE OBJECTIVE :

Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, the student will be in a position to assess quality and serviceability conditions of roads

UNIT 1 PAVEMENT MATERIALS AND SUBGRADE ANALYSIS 9

Introduction – Pavement as layered structure – Pavement types -rigid and flexible-Subgrade analysis- Stress and deflections in pavements- Pavement Materials and Testing- Modified Binders.

UNIT 2 DESIGN OF FLEXIBLE PAVEMENTS 9

Flexible pavement design – Advantages and disadvantages -Factors influencing design of flexible pavement, Empirical – Mechanistic empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads.

UNIT 3 DESIGN OF RIGID PAVEMENTS 9

Cement concrete pavements Factors influencing CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India.

UNIT 4 PAVEMENT CONSTRUCTION, EVALUATION AND MAINTENANCE 9

Construction Techniques practice of flexible and concrete pavement Evaluation - Causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural Evaluation by Deflection Measurements - Pavement Serviceability index, - Pavement maintenance (IRC Recommendations only).

UNIT 5 STABILIZATION OF PAVEMENTS 9

Stabilization with special reference to highway pavements – Choice of stabilizers – Testing and field control - Stabilization for rural roads in India – Use of Geosynthetics in roads.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 Get knowledge about types of rigid and flexible pavements.

2 Able to design of rigid pavements

3 Able to design of flexible pavements

4 Determine the causes of distress in rigid and flexible pavements.

5 Understand stabilization of pavements, testing and field control

TEXT BOOKS

1. Khanna, S.K. and Justo C.E.G.and Veeraragavan, A, "Highway Engineering", New Chand and Brothers, Revised 10th Edition,2014.
2. Kadiyali, L.R., Principles and Practice of Highway Engineering", Khannatech. Publications, New Delhi,2015.

REFERENCE BOOKS

1. Yoder, R.J. and Witchak M.W. "Principles of Pavement Design", John Wiley2000.
2. Guidelines for the Design of Flexible Pavements, IRC-37–2012, The Indian roads Congress, New Delhi.
3. Guideline for the Design of Rigid Pavements for Highways, IRC 58-2018, The Indian Road Congress, New Delhi.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3				3	1		2					3	2	
CO2	1		3		2		1		2			2	3	3	1
CO3	3	3	3	2	3		2	3			2	3	3	3	1
CO4	2	3	2	2	2	3	3	3			3	3	3	3	2
CO5	3	2	1	1	2	3	1	3		1	3	3	2	1	2

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

Category PEC

U23CP45	**SMART CITIES**	**L T P C**
SDG 9		**3 0 0 3**

COURSE OBJECTIVE :

To help the leaners to understand the concepts of smart city and to introduce the students about application of technologies in smart cities

UNIT 1 INTRODUCTION 9

Urbanization, need of focused development, role of Authorities, Smart city, Opportunity and Challenges- Smart infrastructures for city- Smart Cities Mission

UNIT 2 SMART PHYSICAL INFRASTRUCTURE 9

Infrastructure development in Smart Cities - Physical Infrastructure, Land Use - Compact/mixed-use development, Transit oriented development (TOD); Smart City Management-Transportation Unified governance structure (UMTA). Smart public transportation, Smart parking, Intelligent traffic management, Detour management; Low emission vehicles, Electric Mobility - Environmental projects

UNIT 3 SUSTAINABILITY AND SMART PLANNING 9

Relationship Between Sustainability and Smart planning - Place making project guidelines- Surveillance, Smart Street Lighting, Intelligent Emergency Services, Intelligent Disaster Forecasting and Management, GIS-based Spatial Decision Support Systems, Smart Communication Services;

UNIT 4 APPLICATION OF TECHNOLOGIES IN SMART CITIES 9

Role of Technologies in Smart Cities - Integrated Command and Control Center (ICCC), Data Analytics, Data driven strategies implementation in smart cities

UNIT 5 SMART CITIES PROJECT MANAGEMENT 9

Need for project management, Philosophy and concepts; Project phasing and stages; Project organizational structuring: Planning and Scheduling: Project cost analysis; Procurement and Contracting: PPP: Project Monitoring and Evaluation: Risk Management; Case studies

TOTAL : 45 PERIODS

COURSE OUTCOMES

1	Understand the basics of Urbanization and the role of smart cities
2	Gain knowledge on implementation of smart physical infrastructure
3	Understand the role of smart planning for sustainable development
4	Comprehend the knowledge of Technologies in Smart City planning
5	Reviewing the case studies of smart city projects.

TEXT BOOKS

1. P Sharma , “Sustainable Smart cities in India, Challenges and Future Perspectives”, Springer Link, 2017
2. Sameer Sharma, “Smart Cities Unbounded- Ideas and Practice of Smart Cities in India”, Bloomsbury India, 2018.

REFERENCE BOOKS

1. Binti Singh, ManojParmar, “Smart City in India Urban Laboratory, Paradigm or Trajectory? Routledge India,2019
2. https://smartcities.gov.in/guidelines#block-habikon-content
3. https://smartnet.niua.org/learn/library

CO’s-PO’s & PSO’s MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	1	2	1	3	2	3	1	1	2	2	1	3	3	2
CO2	3	3	3	2	1	3	3	2	3	1	3	1	3	3	3
CO3	3	1	3	2	1	1	3	3	2	2	3	2	3	2	3
CO4	3	2	2	2	3	2	3	2	3	1	3	2	3	2	2
CO5	2	2	3	3	2	2	2	2	3	3	2	2	2	3	3

Correlation levels: 1 – low 2 – medium 3 – high “-“- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

Category PEC

U23CEP46	**METRO ENGINEERING**	**L T P C**
SDG 9		**3 0 0 3**

COURSE OBJECTIVE :

1. To understand the importance, planning, and development of metro rail systems in urban transportation.
2. To study the design and construction features of metro structures and components.

UNIT 1 INTRODUCTION TO METRO SYSTEMS 9

Need for metro rail systems – Evolution and growth of metro rail in India and abroad – Types of metro systems: elevated, underground, and at-grade systems - Comparison with other urban transport modes - Planning, feasibility studies, and policy framework for metro development - Organizational structure and project implementation models (PPP, BOT, EPC).

UNIT 2 ALIGNMENT AND STATION PLANNING 9

Route alignment selection – design parameters, horizontal and vertical curves, gradient. -Station location, planning, and design – passenger flow, platform arrangements, entry/exit, escalators, elevators - Interchange and terminal stations - Integration with other modes of transport (buses, suburban rail).

UNIT 3 TRACK, TUNNELING AND STRUCTURAL COMPONENTS 9

Permanent way – rail sections, sleepers, fastenings, ballastless track, turnouts, and crossings - Elevated structures – design concept of viaducts, piers, and bearings - Underground structures – tunneling methods (NATM, TBM, cut and cover) - ventilation, and waterproofing - Construction sequence and safety aspects

UNIT 4 SYSTEMS AND OPERATION 9

Traction and power supply system – Signaling and train control system – ATP, ATO, CBTC - Communication system – SCADA, PA systems, fiber optic network. - Rolling stock – types, bogies, braking, doors, and passenger amenities- Operation planning, maintenance scheduling, and depot layout.

UNIT 5 SAFETY, ENVIRONMENT AND CASE STUDIES 9

Safety measures during construction and operation - Fire safety, disaster management, and emergency evacuation - Environmental and social impact assessment - Cost estimation, tendering, and project management overview Case studies: Delhi Metro, Chennai Metro, Bangalore Metro, Mumbai Metro – key lessons and innovations.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1	Explain the different metro systems
2	Discuss construction methods for elevated and underground section
3	Explain the construction quality and safety
4	Apply electronic signaling systems and automatic fare collection
5	Discuss the SCADA, lifts and escalators

TEXT BOOKS

1. S. C. Saxena & S. Arora, 'A Course in Railway Engineering', Dhanpat Rai & Sons, New Delhi, Latest Edition.
2. Dr. S. P. Arora and S. C. Saxena, 'Railway Engineering', Dhanpat Rai Publications

REFERENCE BOOKS

1. Indian Railway Codes and Manuals – IRPWM, IRS Specifications
2. RITES Ltd., 'Metro Rail System Design Guidelines', Ministry of Railways.
3. Delhi Metro Rail Corporation (DMRC) – Technical Papers and Project Reports.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	1			2	2			1			1	3	2
CO2	3	2	3	2	2	1	2		1	2			2	3	3
CO3	3	3	3	2	3		2	1	1	2			2	3	3
CO4	2	2	3	3	3	1	3	1		2	1		2	3	3
CO5	2	2	2	1	1	3	3	3	2	3	2		3	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

Category PEC

U23CEP47	**AIRPORT AND HARBOUR ENGINEERING**	**L T P C**
SDG 9		**3 0 0 3**

COURSE OBJECTIVE :

To introduce the students about airport planning, design, construction and planning design principles of seaport.

UNIT 1 AIRPORT PLANNING 9

Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area

UNIT 2 AIRPORT COMPONENTS 9

Airport Classification, Planning of Airfield Components – Runway, Taxiway, Apron, Hangar- Passenger Terminals- Geometric design of runway and taxiways-Runway pavement Design- Difference between Highway and airport pavements- Introduction to various design methods- Airport drainage.

UNIT 3 AIRPORT DESIGN 9

Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design – Elements of Runway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings- Air Traffic Airport Classification, Planning of Airfield Components – Runway, Taxiway, Apron, Hangar- Passenger Terminals- Geometric design of runway and taxiways Runway pavement Design- Difference between Highway and airport pavements- Introduction to various design methods- Airport drainage. Control Tower- Instrumental Landing.

UNIT 4 SEAPORTS COMPONENTS AND CONSTRUCTION 9

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks- Dry and Floating Dock, Waves and Tides – Planning and Design of Harbors: Harbours Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins Floating Landing Stage – Navigational Aids-Inland Water Transport.

UNIT 5 SEAPORT REGULATIONS AND EIA 9

Wave action on Coastal Structures and Shore Protection and Reclamation – Coastal Regulation Zone, 2011-EIA – methods of impact analysis and its process

TOTAL : 45 PERIODS

COURSE OUTCOMES

1	Gain an insight on the planning and site selection of Airport Planning and design
2	Knowledge on Design of various Airport components.
3	Knowledge on Design of various Airport components.
4	Understand the various features in Harbors and Ports, their construction, coastal protection works.

5 Knowledge on various Environmental Regulations and Acts.

TEXT BOOKS

1.Khanna.S.K. Arora.M.G and Jain.S.S , Airport Planning and Design, Nemachand and Bros, Roorkee,1994

2.Robert Honjeff and Francis X. Mckelvey, "Planning and Design of Airports", McGraw Hill, New York,1996 2. Richard De Neufille and Amedeo Odoni, "Airport Systems Planning and Design", McGraw Hill, New York,2003

REFERENCE BOOKS

1. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, SciTech Publications (India), Chennai, 2010

2. Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels., Universities Press (India) Private Limited, Hyderabad, 2015.

3. Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi, 2013.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1		3	3	2	3		2	3			1	2	3	2	2
CO2	3	3		2	2	3	2	1	2			2	3	3	3
CO3		3	3	2	3		2	3			1	2	3	3	2
CO4	3	3		2	2	3	2	1	2			2	3	2	3
CO5	3	2	3	3			2				1		2	2	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan/Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

VERTICAL V:ENVIRONMENTAL AND WATER RESOURCE ENGINEERING

U23CEP51 **AIR POLLUTION AND MANAGEMENT** **Category : PEC**
SDG:9

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1. Introduction to Air Pollution
2. Learn the effects of air pollutants on health, materials, vegetation, and climate.
3. Learn the effects of air pollutants on health, materials, vegetation, and climate.
4. Gain knowledge about air pollution monitoring, sampling techniques, and air quality standards.
5. Understand and control equipment and management strategies for air pollution mitigation

UNIT 1 INTRODUCTION 9

Definition and scope of air pollution-Composition of atmosphere-Classification of pollutants: primary and secondary- Sources of air pollution: stationary, mobile, and natural sources-Effects of air pollution on human health, animals, vegetation, materials, and climate-Major air pollution episodes and case studies

UNIT 2 METEOROLOGY AND DISPERSION OF AIR POLLUTANTS 9

Structure of the atmosphere-Lapse rates and atmospheric stability-Wind velocity and direction – wind rose diagrams-Plume behavior and types-Gaussian dispersion model for pollutant dispersion Mixing height, plume rise and effective stack height

UNIT 3 AIR POLLUTION SAMPLING AND MEASUREMENT 9

Sampling of gaseous and particulate pollutants-Stack sampling and analysis-Principles and methods of ambient air quality monitoring- High-volume samplers, impactors, air filters-Continuous monitoring systems= Air quality standards (NAAQS, WHO) Air Quality Index (AQI) – interpretation and applications

UNIT 4 AIR POLLUTION CONTROL TECHNIQUES 9

Control of particulate matter: gravity settling chambers, cyclones, scrubbers, electrostatic precipitators, bag filters Control of gaseous pollutants: absorption, adsorption, condensation, combustion, catalytic conveControl of automobile emissions and fuel quality improvement Indoor air pollution and ventilation control

UNIT 5 AIR QUALITY MANAGEMENT AND LEGISLATION 9

Air quality management planning process-Emission inventories and source apportionment-Zoning, land use, and site selection for industries- Noise pollution – sources, effects, and control measures-Air (Prevention and Control of Pollution) Act, 1981- Environmental Protection Act, 1986- Role of Central and State Pollution Control Boards-Sustainable practices for air pollution management

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Identify and classify the different types and sources of air pollutants and describe their effects on human health, materials, and the environment.

CO2: Explain the meteorological parameters and atmospheric processes that influence the dispersion and transport of air pollutants.

CO3: Apply air pollution sampling and monitoring techniques to assess air quality and interpret results with reference to national and international standards

CO4: Evaluate and select suitable control equipment and techniques for particulate and gaseous pollutant removal, including indoor air pollution control

CO5: Develop air pollution management plans considering legislation, regulatory frameworks, and sustainable engineering practices.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. M **. N. Rao and H. V. N. Rao**, *Air Pollution*, Tata McGraw Hill.
2. **K. Wark and C. F. Warner**, *Air Pollution: Its Origin and Control*, Harper & Row.
3. **N. De Nevers**, *Air Pollution Control Engineering*, McGraw Hill.
4. **R. K. Trivedy and P. K. Goel**, *Introduction to Air Pollution*, Technoscience Publications.

REFERENCES:

1. **Boubel, R.W. et al.**, *Fundamentals of Air Pollution*, Elsevier.
2. **Seinfeld and Pandis**, *Atmospheric Chemistry and Physics*, Wiley.
3. CPCB and MoEF&CC reports on National Air Quality Standards.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	2	1	-	-	1	-	2	3	-	-
CO2	3	3	2	2	2	-	-	-	-	1	-	2	3	2	1
CO3	3	3	3	2	-	1	-	-	-	1	-	3	3	2	2
CO4	3	3	3	2	-	-	-	-	3-	1	-	3	3	3	3
CO5	3	3	3	3	3	1	1	1	1	2	2	3	3	3	3

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP52 **HYDROLOGY** **Category : PEC**

SDG:9

L	T	P	C
2	0	0	2

COURSE OBJECTIVE:

1. To introduce to the students, the concepts of hydrological processes, hydrological extremes and Ground water.
2. To prepare the students to quantify, regulate and manage water resources.
3. Apply hydrological data analysis techniques for estimating rainfall, runoff, and other hydrologic parameters.
4. Understand the principles of surface and groundwater hydrology, including aquifer properties and well hydraulics.

UNIT 1 **PRECIPITATION AND ABSTRACTIONS** **9**

Hydrological cycle - Meteorological measurements – Types and forms of precipitation - Rain gauges - Spatial analysis of rainfall data using Thiessen polygon and Iso-hyetal methods - Interception – Evaporation: Measurement, Evaporation suppression methods – Infiltration: Horton‟s equation - Double ring infiltrometer - Infiltration indices.

UNIT 2 **RUNOFF** **9**

Catchment: Definition, Morphological characteristics - Factors affecting runoff - Run off estimation using Strange's table and empirical methods - SCS-CN method – Stage discharge relationship - Flow measurements - Hydrograph – Unit Hydrograph – IUH.

UNIT 3 **HYDROLOGICAL EXTREMES** **9**

Natural Disasters - Frequency analysis - Flood estimation - Flood management - Definitions of drought: Meteorological, Hydrological, Agricultural and Integrated - IMD method - NDVI analysis - Drought Prone Area Programme (DPAP).

UNIT 4 **RESERVOIRS** **9**

Classification of reservoirs - Site selection - General principles of design - Spillways -Elevation-Area- Capacity curve - Storage estimation - Sedimentation - Life of reservoirs – Rule curve.

UNIT 5 **GROUNDWATER AND MANAGEMENT** **9**

Origin - Classification and types - Properties of aquifers - Governing equations – Steady and unsteady flow - Artificial recharge - RWH in rural and urban areas.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Define the hydrological processes and their integrated behaviour in catchments
CO2: Apply the knowledge of hydrological processes to address basin characteristics, runoff and hydrograph
CO3: Explain the concept of hydrological extremes and its management strategies
CO4: Describe the principles of storage reservoirs
CO5: Understand and apply the concepts of groundwater management

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Subramanya K, "Engineering Hydrology"- Tata McGraw Hill, 2010
2. Jayarami Reddy P, "Hydrology", Tata McGraw Hill, 2008

REFERENCES:

1. David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007
2. Ven Te Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998.
3. Raghunath. H.M., "Hydrology", Wiley Eastern Ltd., 1998.
4. Bhagu R. Chahar, Groundwater Hydrology, McGraw Hill Education (India) Pvt Ltd, New Delhi, 2017.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	2	2	-	2	2	-	2	2	2	1
CO2	2	3	2	2	1	2	2	-	3	2	-	2	-	2	1
CO3	2	2	1	-	-	2	2	-	2	2	2	2	1	2	-
CO4	2	2	1	1	1	3	2	2	2	2	-	3	2	-	-
CO5	2	2	2	2	1	3	2	2	3	2	2	3	1	2	1

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP53 **ENVIRONMENTAL IMPACT ASSESSMENT** **Category : PEC**

SDG:9

L	T	P	C
2	0	0	2

COURSE OBJECTIVE:

1. To expose the students to the need, methodology, documentation and usefulness of Environmental impact assessment.
2. To develop the skill to prepare environmental management plan.
3. To participate in the performance of an environmental assessment process (EIA or SEA)
4. The disciplinary knowledge and skills in natural sciences and engineering the student have achieved in other courses.
5. To develop the skill about the building construction projects

UNIT 1 **INTRODUCTION** **9**

Historical development of Environmental Impact Assessment (EIA). Environmental Clearance- EIA in project cycle. Legal and regulatory aspects in India – types and limitations of EIA –EIA process screening – scoping - terms of reference in EIA- setting – analysis – mitigation. Cross sectoral issues –public hearing in EIA- EIA consultant accreditation.

UNIT 2 **IMPACT INDENTIFICATION AND PREDICTION** **9**

Matrices – networks – checklists – cost benefit analysis – analysis of alternatives – expert systems in EIA. prediction tools for EIA – mathematical modelling for impact prediction – assessment of impacts – air – water – soil – noise – biological — cumulative impact assessment.

UNIT 3 **SOCIO-ECONOMIC IMPACT ASSESSMENT** **9**

Socio-economic impact assessment - relationship between social impacts and change in community and institutional arrangements. factors and methodologies- individual and family level impacts. communities in transition-rehabilitation

UNIT 4 **EIA DOCUMENTATION AND ENVIRONMENTAL MANAGEMENT PLAN** **9**

Environmental management plan - preparation, implementation and review – mitigation and rehabilitation plans – policy and guidelines for planning and monitoring programmes – post project audit – documentation of EIA findings – ethical and quality aspects of environmental impact assessment.

UNIT 5 **CASE STUDIES** **9**

Mining, power plants, cement plants, highways, petroleum refining industry, storage & handling of hazardous chemicals, common hazardous waste facilities, CETPs, CMSWMF, building and construction projects.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: carry out scoping and screening of developmental projects for environmental and social assessments

CO2: explain different methodologies for environmental impact prediction and assessment
CO3: asses socio-economic investigation of the environment in a project
CO4: plan environmental impact assessments and environmental management plans
CO5: knowledge to prepare environmental impact assessment reports for various projects

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Canter, L.W., "Environmental Impact Assessment", McGraw Hill, New York. 1996
2. Lawrence, D.P., "Environmental Impact Assessment – Practical solutions to recurrent problems", Wiley-Interscience, New Jersey. 2003

REFERENCES:

1. Cutter, S.L., "Environmental Risk and Hazards", Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
2. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York,1996.
3. K. V. Raghavan and A A. Khan, "Methodologies in Hazard Identification and Risk Assessment", Manual by CLRI, 1990.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	2	3	3	-	-	-	1	-	-
CO2	3	2	3	2	2	-	-	3	2	-	-	1	-	2	2
CO3	-	2	3	2	2	-	-	3	2	-	-	1	-	2	-
CO4	-	-	3	-	3	2	2	2	2	1	1	-	-	2	2
CO5	3	-	-	2	-	-	-	2	-	-	-	-	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP54 **ENVIRONMENTAL HEALTH &SAFETY** **Category : PEC**

SDG:9

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

1.To educate overview of EHS in industries and related Indian regulations, types of Health hazards, effect, assessment and control methods and EHS Management System. 2.Develop an understanding of the fundamental concepts of environmental health and safety and their significance in sustainable development.
3.Familiarize students with environmental laws, regulations, and management systems for pollution control and occupational safety.
4.Familiarize students with environmental laws, regulations, and management systems for pollution control and occupational safety.
5.Encourage ethical, responsible, and sustainable decision-making in professional and industrial environments.

UNIT 1 **INTRODUCTION** **9**

Need for developing Environment, Health and Safety systems in work places- International initiatives, National Policy and Legislations on EHS in India - Regulations and Codes of Practice - Role of trade union safety representatives - Ergonomics**.**

UNIT 2 **OCCUPATIONAL HEALTH AND HYGIENE** **9**

Definition of occupational health and hygiene - Categories of health hazards – Exposure pathways and human responses–Exposure Assessment-occupational exposure limits - Hierarchy of control measures - Role of personal protective equipment and the selection criteria

UNIT 3 **WORKPLACE SAFETY AND SAFETY SYSTEMS** **9**

Features of Satisfactory and Safe design of work premises – good housekeeping - lighting and color, Ventilation and Heat Control, Noise, Chemical and Radiation Safety – Electrical Safety – Fire Safety – Safety at Construction sites, ETP – Machine guarding – Process Safety, Working at different levels

UNIT 4 **HAZARDS AND RISK MANAGEMENT** **9**

Safety appraisal – Job Safety Analysis-Control techniques – plant safety inspection – Accident investigation - Analysis and Reporting – Hazard and Risk Management Techniques –Onsite and Offsite emergency Plans. Employee Participation- Education and Training- Case Studies

UNIT 5 **ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT** **9**

Concept of Environmental Health and Safety Management – Elements of Environmental Health and Safety Management Policy and implementation and review – ISO 45001-Strucure and Clauses-Case Studies

COURSE OUTCOMES:

Upon completion of this course, student will be able to:
CO1: Need for EHS in industries and related Indian regulations.
CO2: Various types of Health hazards, effect, assessment and control methods
CO3: Various safety systems in working environments
CO4: The methodology for preparation of Emergency Plans and Accident investigation
CO5: EHS Management System and its elements

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Industrial Health and Safety Acts and Amendments, by Ministry of Labour and Employment, Government of India
2. Fundamentals of Industrial Safety and Health by Dr.K.U.Mistry, Siddharth Prakashan, 2012 .

REFERENCES:

1. Effective Environmental, Health, and Safety Management Using the Team Approach by Bill Taylor, Culinary and Hospitality Industry Publications Services, 2005.
2. Environmental and Health and Safety Management by Nicholas P.Cheremisinoff and Madelyn L. Graffia, William Andrew Inc. NY, 1995.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	-	3	-	3	-	3	-	3	2	1	1	2	-	2	-
CO2	2	2	2	3	-	-	-	-	2	-	1	3	-	-	-
CO3	-	-	2	-	3	3	1	1	2	-	2	3	-	-	-
CO4	-	-	3	2		1	2	-	-	-	-	-	2	2	2
CO5	1	-	-	-	5	-	-	-	1	-	1	-	1	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP55

GROUND WATER ENGINEERING **Category : PEC**

SDG:

L	T	P	C
2	0	0	2

COURSE OBJECTIVE:

1. The objective of this course is enable the student to understand the principles of Groundwater governing Equations,
2. Characteristics of different aquifers and techniques of groundwater model development and management.
3. Understand the fundamental principles governing the occurrence, movement, and distribution of groundwater.
4. Understand the fundamental principles governing the occurrence, movement, and distribution of groundwater.
5. Gain knowledge of groundwater quality, contamination sources, and remediation methods

UNIT 1 HYDROGEOLOGICAL PARAMETERS 9

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, transmissivity and storage coefficient – Methods of Estimation – GEC norms - Steady state flow - Darcy's Law - Groundwater Velocity –- Dupuit Forchheimer assumption – Steady Radial Flow into a Well.

UNIT 2 WELL HYDRAULICS 9

Unsteady state flow - Theis method - Jacob method – Chow's method – Law of Times – Theis Recovery – Bailer method – Slug method - tests - Image well theory – Partial penetrations of wells - Well losses – Specific Capacity and Safe yield - Collector well and Infiltration gallery

UNIT 3 GROUNDWATER MANAGEMENT 9

Need for Management Model – Database for Groundwater Management – Groundwater balance study – Introduction to Mathematical model – Model Conceptualization – Initial and Boundary Condition – Calibration – Validation – Future Prediction – Sensitivity Analysis – Uncertainty – Development of a model

UNIT 4 GROUNDWATER QUALITY 9

Ground water chemistry - Origin, movement and quality - Water quality standards – Drinking water Industrial water – Irrigation water - Groundwater Pollution and legislation - Environmental Regulatory requirements

UNIT 5 GROUNDWATER CONSERVATION 9

Artificial recharge techniques – Reclaimed wastewater recharge – Soil aquifer treatment (SAT) – Aquifer Storage and Recovery (ASR) Seawater Intrusion and Remediation – Ground water Basin management and Conjunctive use – Protection zone delineation, Contamination source inventory and remediation schemes

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Define the groundwater system basic, types of aquifers, aquifer parameters, movement and its potential for confined and unconfined aquifers

CO2: Apply the knowledge of groundwater flow in steady and unsteady flow characteristics of well hydraulics

CO3: Explain the concept of groundwater model development and data base management for groundwater management

CO4: Describe the importance of artificial recharge and groundwater quality concepts

CO5: Apply the creative and innovative technique on conservation of groundwater

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi,2010.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York,2000.

REFERENCES:

1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press,2002.
2. Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 1998.
3. Chahar BR, Groundwater hydrology, McGraw Hill Education (India) Pvt Ltd, New Delhi, 2015.
4. RastogiA.K. , Numerical Groundwater Hydrology,2011

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	1	-	-	-	1	2	3	-
CO2	3	2	1	-	-	-	-	-	1	1	-	1	-	-	-
CO3	3	-	1	-	-	-	1	-	1	1	-	1	-	-	-
CO4	3	1	-	1	-	-	1	-	1	1	-	1	-	-	-
CO5	3	1	-	1	-	-	1	-	1	1	-	1	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP56

MUNICIPAL SOLID WASTE MANAGEMENT **Category : PEC**

SDG:

L	T	P	C
2	0	0	2

COURSE OBJECTIVE:

1. To make the students conversant with the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste.
2. To provide students with a comprehensive understanding of the principles, methods, and technologies involved in the management of municipal solid waste.
3. The course aims to develop knowledge and skills related to waste generation, collection, transportation, processing, treatment, and disposal.
4. To with an emphasis on sustainable practices, environmental protection, and resource recovery.
5. Students will also learn about regulatory frameworks, planning, and the application of modern tools and techniques for efficient solid waste management systems

UNIT 1 SOURCES AND CHARACTERISTICS 9

Sources and types of municipal solid wastes- Public health and environmental impacts of improper disposal of solid wastes- sampling and characterization of wastes - factors affecting waste generation rate and characteristics - Elements of integrated solid waste management – Requirements and salient features of Solid waste management rules (2016) –- Role of public and NGO‟s- Public Private participation – Elements of Municipal Solid Waste Management Plan**.**

UNIT 2 SOURCE REDUCTION , WASTE STORAGE AND RECYCLING 9

Waste Management Hierarchy - Reduction, Reuse and Recycling - source reduction of waste – On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – case studies under Indian conditions – Recycling of Plastics and Construction/Demolition wastes.

UNIT 3 COLLECTION AND TRANSFER OF WASTES 9

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of waste collection systems; Transfer stations –location, operation and maintenance; options under Indian conditions – Field problems- solving.

UNIT 4 PROCESSING OF WASTES 9

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

UNIT 5 WASTE DISPOSAL 9

Land disposal of solid waste- Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor – Dumpsite Rehabilitation

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management

CO2: Reduction, reuse and recycling of waste.

CO3: ability to plan and design systems for storage, collection, transport, processing and disposal of municipal solid waste

CO4: knowledge on the issues on solid waste management from an integrated and holistic Perspective, as well as in the local and international context.

CO5: Design and operation of sanitary landfill.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. William A. Worrell, P. Aarne Vesilind (2012) Solid Waste Engineering, Cengage Learning, 2012. 2. 2.John Pitchel (2014), Waste Management Practices-Municipal, Hazardous and industrial – CRC Press, Taylor and Francis, New York.

REFERENCES:

1. CPHEEO (2014), "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi.
2 George Tchobanoglous and FrankKreith (2002).Handbook of Solid waste management, McGraw Hill, New York.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	2	2	-	2	2	-	2	2	2	1
CO2	2	3	2	2	1	2	2	-	3	2	-	2	-	2	1
CO3	2	2	1	-	-	2	2	-	2	2	2	2	1	2	-
CO4	2	2	1	1	1	3	2	2	2	2	-	3	2	-	-
CO5	2	2	2	2	1	3	2	2	3	2	2	3	1	2	1

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEP57

ENVIRONMENTAL ENGINEERING **Category : PEC**

SDG:9

COURSE OBJECTIVE:

1. To study the water sources and quality of water.
2. To get knowledge about the treatment of water.
3. To study about the storage of water and distribution.
4. To study about the planning and design of sewerage system.
5. To study about the treatment and disposal of sewage.

UNIT 1 WATER SUPPLY ENGINEERING 9

Surface and sub-surface of water resources-water quality analysis-water borne diseases-standard potable water-water intake structures.

UNIT 2 TREATMENT OF WATER 9

Objectives of water treatment-flow diagram of treatment plant-sedimentation-types of sedimentation-coagulation-types of sedimentation tanks-types of filters-disinfection of water-methods of disinfection water water softening

UNIT 3 WATER STORAGE AND DISTRIBUTION 9

Distribution systems-methods of distribution-gravity system, pumping system, combined system systems of water supply-continuous and intermittent supply of water-service reservoirs-types.

UNIT 4 PLANNING AND DESIGN OF SEWERAGE SYSTEM 9

Sewage characteristics-quantity of sewage-variation in rate of flow of sewage-estimation of storm water-shapes of sewer-materials used for sewer-joints in sewer lines-Laying and testing of sewer lines- ventilation of sewer-cleaning of sewer.

UNIT 5 TREATMENT AND DISPOSAL OF SEWAGE 9

Objects of sewage treatment-flow diagram of sewage treatment plant-treatment of sewage-primary and secondary treatment-screens-skimming tank-grit chambers-types and description of filters-activated sludge process-construction and working of septic tank-methods of sludge disposal.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1: Understand the quality and testing of water
CO2: Understand the filtering systems of water
CO3: Understand about the supplying of water

CO4: Understand about the sewage system in construction
CO5: Understand about the disposal of sewage

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Water Supply and Sanitary Engineering – G.S. Birdie & J.S. Birdie
   Classic book covering both water supply and sewage treatment basics.
2. Water Supply Engineering – Dr. P.N. Modi Good for water intake, treatment methods, storage, and Distribution.
3. Environmental Engineering: Volume I (Water Supply Engineering) – S.K. Garg
   Excellent for fundamentals and treatment process

REFERENCES:

1. Environmental Engineering – Peavy, Rowe & Tchobanoglous Standard international reference with strong theoretical background.
2. Water and Wastewater Engineering – Fair, Geyer & Okun

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	1	1	1	-	-	1	-	1	1	-	1	-	2	1
CO2	2	2	-	-	-	-	1	-	1	1	-	1	-	1	-
CO3	-	1	1	-	-	-	1	-	1	1	-	1	2	-	2
CO4	2	1	1	1	-	-	1	-	1	1	-	2	-	2	-
CO5	1	1	1	1	-	-	1	-	1	1	-	1	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/Assistant Professor **Department of Civil Engineering**	**Dr.M.Samuel Thanaraj/Associate Professor** **Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

VERTCAL 6:DIVERSIIED COURSE

Category:PEC

U23CEP61	**3D PRINTING IN CIVIL ENGINEERING**	**L T P C**
SDG:9		**3 0 0 3**

COURSE OBJECTIVE :

1. To explore technology used in Additive Manufacturing (AM).
2. To understand the significance of various additive manufacturing in recent manufacturing process.
3. To obtain knowledge in AM techniques and develop skills to select relevant additive manufacturing process.
4. To high-lighten the importance of additive manufacturing in various industrial sectors
5. To apply 3D printing technology in the field of Civil Engineering

UNIT 1 INTRODUCTION OF ADDITIVE MANUFACTURING 9

Introduction to AM - Historical development - Advantages of AM-AM process chain - Conceptualization3D modeling Data Conversion to STL - Building setup - Post processing - AM data formats - Classification of AM process -Applications to various fields.

UNIT 2 PRE-PROCESSING IN AM 9

Reverse engineering - Reconstruction of 3D-CAD model using reverse engineering, Part orientation and support generation - Slicing - Material preparation to build product.

UNIT 3 LIQUID BASED AND SOLID BASED AM SYSTEMS 9

Liquidbasedsystem-Stereo Lithography Apparatus (SLA)-Principle-process -advantages and disadvantages - applications and case studies. Solidbasedsystem- Fused Deposition Modeling (FDM) - Principle - process – advantagesanddisadvantages - applications - case studies.

UNIT 4 POWDER BASED AM SYSTEMS 9

Selective Laser Sintering (SLS)- Principle - process - advantages and disadvantages - applications and case studies - Laser Engineered Net Shaping (LENS) - Principle - process - advantages and disadvantagesapplications case studies.

UNIT 5 MEDICAL AND BIO-AM 9

Customized implants and prosthesis - Design and production - Bio-Additive Manufacturing - Computer Aided Tissue Engineering (CATE) - Case studies..

TOTAL : 45 PERIODS

COURSE OUTCOMES

By the end of this course, students should be able to:

CO1:Identify the various process utilized in AM

CO2:Choose suitable process and materials used in AM

CO3: Apply the obtained knowledge of AM in various real-life applications

CO4:Apply reverse engineering for geometry transformation in AM

CO5:Understand the role of Additive Manufacturing in medical and bio-engineering applications.

REFERENCE BOOKS

1. Chua C.K., Leong K.F. and Lim C.S Rapid prototyping: Principles an Applications, World Scientific publications, 3rdEd., 2010
2. D.T. Pham and S.S. Dimov, "Rapid Manufacturing", Springer, 2001
3. Terry Wohlers, "Wholers Report 2000",Wohlers Associates, 2000
4. Paul F. Jacobs, "Rapid Prototyping and Manufacturing", ASME Press, 1999
5. lan Gibson, Davin Rosen and Brent Stucker "Additive Manufacturing Technologies, Springer, 2nd Ed, 2014.

CO's-PO's&PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	-	-	1	2	-	2	3	2	2
CO2	3	3	3	2	3	-	-	-	-	1	-	3	3	3	3
CO3	3	2	3	2	2	-	-	-	-	2	-	3	3	3	2
CO4	3	3	3	2	3	-	-	-	-	1	-	3	3	3	3
CO5	2	2	3	-	2	2	3	2	1	2	1	3	2	3	3

Correlationlevels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Sivaraja/Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category: PEC

U23CEP62 SELECTION AND TESTING OF MATERIALS

SDG: 9

L	T	P	C
3	0	0	3

COURSE OBJECTIVE :

1. To understand the structure and properties of engineering materials.
2. To learn the criteria for selecting materials for various engineering applications.
3. To Study different destructive and non-destructive testing methods.
4. To evaluate mechanical and physical properties of materials through testing.

To understand the behaviour of materials under different environmental and loading conditions

UNIT 1 INTRODUCTION TO ENGINEERING MATERIALS 9

Classification of engineering materials – Metals, Ceramics, Polymers, and Composites – Structure and bonding – Crystalline and amorphous materials – Mechanical, thermal, electrical, and chemical properties – Effects of alloying – Phase diagrams and microstructures – Material standards and specifications (IS, ASTM).

UNIT 2 MATERIAL SELECTION CRITERIA 9

Factors influencing material selection – Mechanical properties, environmental effects, manufacturing processes, cost, and availability – Design for performance, reliability, and sustainability – Selection charts (Ashby charts) – Case studies: material selection for structural, automotive, and aerospace components.

UNIT 3 DESTRUCTIVE TESTING OF MATERIALS 9

Tension, compression, and bending tests – Hardness tests (Brinell, Rockwell, Vickers) – Impact tests (Izod and Charpy) – Fatigue and creep tests – Wear testing – Fracture testing – Metallography and microstructure analysis.

UNIT 4 NON-DESTRUCTIVE TESTING 9

Introduction to NDT – Advantages and limitations – Visual inspection – Liquid penetrant testing – Magnetic particle testing – Ultrasonic testing – Radiographic testing – Eddy current testing – Acoustic emission testing – Applications in construction and manufacturing industries.

UNIT 5 ADVANCED MATERIALS AND PERFORMANCE EVALUATION 9

Smart materials and nanomaterials – Corrosion testing and prevention – Thermal testing – Environmental degradation – Testing of composites and polymers – Case studies on failure analysis – Quality control and assurance in material testing..

TOTAL : 45 PERIODS

COURSE OUTCOMES

CO1: Explain the structure, classification, and properties of engineering materials.

CO2: Select suitable materials for different engineering applications based on performance and cost.

CO3: Perform and interpret results from destructive testing of materials.

CO4: Apply appropriate non-destructive testing techniques for material evaluation.

CO5: Analyze material performance and failure under various conditions, including advanced and smart materials.

TEXT BOOKS

1. Callister, W.D. & Rethwisch, D.G., *Materials Science and Engineering: An Introduction*, Wiley, 2020.
2. Baldev Raj, T. Jayakumar & M. Thavasimuthu, *Practical Non-Destructive Testing*, Narosa Publishing House, 2014.

REFERENCE BOOKS

1. Van Vlack, L.H., Elements of Materials Science and Engineering, Pearson, 2013.
2. Dieter, G.E., Mechanical Metallurgy, McGraw Hill Education, 2017.
3. Ashby, M.F. & Jones, D.R.H., Engineering Materials: An Introduction to Their Properties and Applications, Elsevier, 2012.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	1	2	-	2	3	2	2
CO2	3	3	3	2	2	-	-	-	-	1	-	3	3	3	3
CO3	3	2	3	2	2	-	-	-	-	1	-	3	3	3	2
CO4	3	3	3	2	3	-	-	-	-	1	-	3	3	3	3
CO5	3	3	3	2	2	2	2	2	1	2	1	3	3	3	3

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Sivaraja/Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category:PEC

U23CEP63 **GIS AND REMOTE SENSING** **L T P C**

SDG: 9 3 0 0 3

COURSE OBJECTIVE :

1. To introduce the concepts and principles of remote sensing and geographic information systems (GIS).
2. To provide knowledge on data acquisition, interpretation, and analysis using satellite imagery.
3. To familiarize students with various GIS data models and spatial analysis techniques.
4. To expose students to applications of GIS and RS in civil engineering fields such as urban planning, transportation, and water resources.
5. To develop practical skills in handling GIS and RS software tools for problem-solving.

UNIT 1 INTRODUCTION TO REMOTE SENSING 9

Definition and scope of remote sensing – Components of remote sensing system Electromagnetic spectrum-Energy sources and radiation principles – Interaction of EMR with atmosphere and earth surface features-Sensors and platforms – Types of resolutions (spatial, spectral, temporal, radiometric)-Aerial photography and satellite imagery – Types, characteristics and advantages.

UNIT 2 IMAGE INTERPRETATION AND ANALYSIS 9

Visual image interpretation – Elements and techniques-Digital image processing – Image rectification, enhancement, classification (supervised and unsupervised)-Image fusion and change detection techniques-Applications of remote sensing in land use/land cover mapping, water resources, and environmental studies.

UNIT 3 INTRODUCTION TO GIS 9

Definition and basic concepts of GIS – Components and architecture- Data types: spatial and non-spatial data-Data models: vector and raster data structures-Coordinate systems and map projections-Data input, editing, and storage in GIS.

UNIT 4 SPATIAL DATA ANALYSIS 9

Data analysis concepts – Spatial queries, overlay operations, buffering, network analysis-Digital Elevation Model (DEM) and terrain analysis-Integration of RS and GIS data- GIS modeling and database management

UNIT 5 APPLICATIONS OF GIS AND REMOTE SENSING IN CIVIL ENGINEERING 9

Urban and regional planning-Water resource management – Watershed and flood mapping-Transportation network planning and management-Environmental impact assessment-Disaster management and infrastructure monitoring.

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1:Understand the basic principles and elements of remote sensing and GIS.

CO2: Interpret and analyze satellite imagery using appropriate techniques.

CO3: Describe GIS data structures, models, and coordinate systems

CO4: Apply spatial data analysis and GIS tools for engineering problem-solving.

CO5: Integrate GIS and remote sensing techniques in various civil engineering applications.

TEXT BOOKS

1. Lillesand, T.M., Kiefer, R.W. and Chipman, J.W., *Remote Sensing and Image Interpretation*, 8th Edition, John Wiley & Sons, 2015.
2. Chang, K.T., *Introduction to Geographic Information Systems*, 9th Edition, McGraw Hill Education, 2022

REFERENCE BOOKS

1. Sabins, F.F., *Remote Sensing: Principles and Interpretation*, 4th Edition, Waveland Press, 2020.
2. Burrough, P.A. and McDonnell, R.A., *Principles of Geographical Information Systems*, Oxford University Press, 2015.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PS O3
CO1	3	2	-	-	1	-	-	-	-	1	-	-	2	3	2
CO2	3	2	2	-	2	-	-	-	-	1	-	-	2	3	2
CO3	3	2	-	-	2	-	-	-	-	1	-	2	2	3	2
CO4	3	3	3	2	3	-	-	-	-	2	-	2	-	3	3
CO5	3	3	3	3	3	-	2	-	-	2	-	-	3	3	3

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Sivaraja/Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category:PEC

U23CEP64	**ENERGY EFFICIENT BUILDINGS**	**L T P C**
SDG: 9		3 0 0 3

COURSE OBJECTIVE :

To provide an understanding of the concept of energy consumption in buildings and design an energy efficient building

UNIT 1 INTRODUCTION 9

Climate adapted and climate rejecting buildings – Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Greenhouse Effect – Convection – Measuring latent and sensible heat – Psychrometry Chart – Thermal Comfort – Microclimate, Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Path Diagrams – Sun Protection – Types of Shading Devices – Design responses to energy conservation strategies.

UNIT 2 PASSIVE SOLAR HEATING AND COOLING 9

General Principles of passive Solar Heating – Key Design Elements – Sunspace – Direct gain – Trombe Walls, Water Walls – Convective Air loops – Concepts – Case Studies – General Principles of Passive Cooling – Ventilation – Principles – Case studies – Courtyards – Roof Ponds– Cool Pools – Predicting ventilation in buildings – Window Ventilation Calculations – Room Organization Strategies for Cross and Stack Ventilation – Radiation – Evaporation and dehumidification – Wind Catchers – Mass Effect – Zoning – Load Control – Air Filtration and odor removal.

UNIT 3 DAYLIGHTING AND ELECTRICAL LIGHTING 9

Materials, components and details – Insulation – Optical materials – Radiant Barriers – Glazing materials – Glazing Spectral Response – Day lighting – Sources and concepts –Building Design Strategies – Case Studies – Daylight apertures – Light Shelves – Codal requirements – Day lighting design – Electric Lighting – Light Distribution – Electric Lighting control for day lighted buildings – 130 Switching controls – Coefficient of utilization – Electric Task Lighting – Electric Light Zones – Power Adjustment Factors

UNIT 4 HEAT CONTROL AND VENTILATION 9

Hourly Solar radiation – Heat insulation – Terminology – Requirements – Heat transmission through building sections – Thermal performance of Building sections – Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings – Influence of Design Parameters – Mechanical controls – Examples. Ventilation – Requirements – Minimum standards for ventilation – Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation – Calculation of probable indoor wind speed

UNIT 5 DESIGN FOR CLIMATIC ZONES 9

Energy efficiency – An Overview of Design Concepts and Architectural Interventions – Embodied Energy – Low Embodied Energy Materials – Passive Downdraft Evaporative Cooling – Design of Energy Efficient Buildings for Various Zones – Cold and cloudy – Cold and sunny – Composite – Hot and dry – Moderate – Warm and humid – Case studies of residences, office buildings and other buildings in each zones – Commonly used software packages in energy efficient building analysis and design - Energy Audit – Certification.

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1: Explain environmental energy supplies on buildings

CO2: Explain the passive solar heating,cooling system

CO3: Discuss the various aspects of day-lighting and electrical lighting in a building

CO4: Predict and design building ventilation and heat control for indoor comfort

CO5: Design a building for climatic zone and apply simulation programs of buildings to perform energy.

REFERENCE BOOKS

1. Energy Conservation Building Code, cau of Energy Efficiency, New Delhi, 2018.
2. Handbook on Functional Requirements of Buildings Part 1 to 4 SP : 41 (S and T) 1995
3. Residential Energy: Cost Savings and Comfort for Existing Buildings by John Krigger and Chris Dorsi, Published by Saturn Resource Management, 2013.
4. Brown, G.Z. and DeKay, M., Sun, Wind and Light - Architectural Design Strategies, John Wiley and Sons Inc,3rd Edition, 2014
5. Majumdar, M (Ed), Energy - Efficient Buildings in India, Tata Energy Research Institute, Ministry of Non-Conventional Energy Sources, 2009

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	-	-	1	-	3	2	3	-	3	3	2	1
CO2	3	-	2	-	-	-	-	3	-	3	-	-	3	2	1
CO3	3	-	2	-	-	-	-	3	-	3	-	-	3	2	2
CO4	3	3	3	-	-	-	-	1	3	-	3	-	3	2	2
CO5	3	3	3	1	2	-	1	3	2	3	-	-	2	3	3

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Sivaraja/Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category:PEC

U23CEP65 BUILDING INFORMATION MODELLING

SDG: 9

L	T	P	C
0	0	6	3

COURSE OBJECTIVE :

1. Learning the concept of Building Information Modelling.
2. Understand the Structural Modelling of buildings from conceptual stage to design stage as per the industrial workflow.
3. Develop the Quantity takeoff Schedule for the project.
4. Learning techniques for extracting 2D Drawing sheets from the 3D model.

TOTAL : 60 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

1. Comprehensive understanding of Building Information modelling (BIM) principles, processes, and applications in construction projects.
2. Develop comprehensive Architectural and structural models for buildings based on project requirements and specifications.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	-	1	-	2	3	2	2
CO2	3	2	3	2	3	-	-	-	-	2	-	3	3	3	3
CO3	3	3	3	2	3	-	-	-	-	2	-	3	3	3	3
CO4	3	2	3	3	3	-	-	-	-	2	3	3	3	3	3
CO5	3	3	3	3	3	-	2	-	2	3	-	3	3	3	3

Correlation levels: 1–low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Sivaraja/Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering

Name and Department	Name and Department of BoS Chairman

Category:PEC

U23CEP66 **AIML IN CIVIL ENGINEERING** **L T P C**

SDG: 9 3 0 0 3

COURSE OBJECTIVE :

To understand the concepts and techniques of AI and ML.

To explore the applications of AI and ML in civil engineering.

To case studies showcasing the integration of AI and ML in civil engineering projects.

To develop skills in implementing AI and ML algorithms for solving preliminary civil engineering problems.

UNIT 1 INTRODUCTION TO AI AND ML 9

Scope of the Course, Introduction to AI and ML, Brief review of History of AI and ML, Related fields2 Introduction to Artificial Neural Networks: Biological Neurons and Biological Neural Networks, Artificial Neural Networks, Activation Functions, Perceptron NN, Multilayer Perceptron NN, Back- propagation Neural Networks, Training Methods, Basic definition of supervised and unsupervised Learning- Introduction to Machine Learning

UNIT 2 STRUCTURAL ANALYSIS AND DESIGN OPTIMIZATION 9

Application of AI/ML in Structural Analysis- Design Optimization Techniques using Genetic Algorithms and Neural Networks, Case Studies: Predictive Maintenance and Optimal Design Solutions, Structural health monitoring with AI techniques, Case studies: predictive modeling for structural integrity assessment

UNIT 3 DESIGN OPTIMIZATION USING MACHINE LEARNING 9

Introduction to design optimization, Genetic algorithms and optimization techniques- Neural network-based optimization- Application of ML in optimal design of civil engineering structures

UNIT 4 AI AND ML IN CONSTRUCTION MANAGEMENT 9

Introduction to construction management, Schedule optimization using ML algorithms, Resource allocation and risk management with AI, Predictive analytics for infrastructure maintenance

UNIT 5 INFRASTRUCTURE MONITORING AND MANAGEMENT 9

Introduction to infrastructure monitoring, IoT and sensor data integration with ML, Implementation of AI and ML algorithms using Python- Ethical considerations in AI and ML applications, Regulatory challenges and standards in civil engineering, Future trends and emerging technologies in AI and ML for civil engineering

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

1. Identify the basics of Artificial Intelligence and Machine Learning.
2. Indicate how AI and ML can improve different activities in civil engineering.
3. Apply AI and ML algorithms to solve problems in civil engineering.
4. Develop skills to apply AI and ML algorithms for solving problems in civil engineering

Web Links

1. https://www.geeksforgeeks.org/machine-learning/
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	-	2	-	-	1	-	2	3	2	2
CO2	2	3	2	2	2	-	1	-	-	1	-	2	3	3	3
CO3	2	3	3	3	2	-	2	-	1	1	-	3	3	3	3
CO4	2	2	3	3	3	-	2	2	2	2	-	3	2	3	2
CO5	2	2	2	3	3	2	3	2	2	3	-	3	2	3	2

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Sivaraja/Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category:PEC

U23CEP67 STRUCTURAL HEALTH MONITORING

SDG: 9 **L T P C**

3 0 0 3

COURSE OBJECTIVE :

To make the students familiar with various structural health monitoring tools and techniques

UNIT 1 INTRODUCTION TO STRUCTURAL HEALTH MONITORING 9

Need for SHM, Structural Health Monitoring versus Non-Destructive Evaluation, Methods of SHMLocal & Global Techniques for SHM, Short & Long-Term Monitoring, Active & Passive Monitoring, Remote Structural Health Monitoring- Advantages of SHM - Challenges in SHM.

UNIT 2 SENSORS AND INSTRUMENTATION FOR SHM 9

Sensors for measurements: Electrical Resistance Strain Gages, Vibrating Wire Strain Gauges, Fiber Optic Sensors, Temperature Sensors, Accelerometers, Displacement Transducers, Load Cells, Humidity Sensors, Crack Propagation Measuring Sensors, Corrosion Monitoring Sensors, Pressure Sensors, Data Acquisition – Data Transmission - Data Processing – Storage of processed data - Knowledgeable information processing.

UNIT 3 STATIC AND DYNAMIC MEASUREMENT TECHNIQUES FOR SHM 9

Static measurement - Load test, Concrete core trepanning, Flat jack techniques, Static response measurement, Dynamic measurement -Vibration based testing- Ambient Excitation methods, Measured forced Vibration-Impact excitation, step relaxation test, shaker excitation method.

UNIT 4 DAMAGE DETECTION 9

Damage Diagnostic methods based on vibrational response- Method based on modal frequency/shape/damping, Curvature and flexibility method, Modal strain energy method, Sensitivity method, Baseline-free method, Cross-correlation method, Damage Diagnostic methods based on wave propagation Methods-Bulk waves/Lamb waves, Reflection and transmission, Wave tuning/mode selectivity, Migration imaging, Phased array imaging, Focusing array/SAFT imaging

UNIT 5 DATA PROCESSING AND CASE STUDIES 9

Advanced signal processing methods -Wavelet, Hilbert-Huang transform, Neural networks, Support Vector Machine Principal component analysis, Outlier analysis. Applications of SHM on bridges and buildings, case studies of SHM in Civil/ Structural engineering..

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

CO1: Understand the need, advantages and challenges of SHM

CO2: Know the different types of sensors and instrumentation techniques

CO3: Gain knowledge of the static and dynamic measurement techniques

CO4: Compare the various damage detection techniques

CO5: Know the various data processing methods through case studies.

REFERENCE BOOKS

1. Daniel Balageas, Peter Fritzen, Alfredo Guemes, Structural Health Monitoring, John Wiley & Sons,2006.
2. Douglas E Adams, Health Monitoring of Structural Materials and Components Methods with Applications, Wiley Publishers, 2007
3. Hua-Peng Chen, Structural Health Monitoring of Large Civil Engineering Structures, Wiley Publishers, 2018
4. Ansari, F Karbhari, Structural health monitoring of civil infrastructure systems, V.M,Woodhead Publishing, 2009
5. J. P. Ou, H. Li and Z. D, "Duan Structural Health Monitoring and Intelligent Infrastructure", Vol1, Taylor and Francis Group, London, UK, 2006.
6. Victor Giurglutiu, "Structural Health Monitoring with Wafer Active Sensors", Academic Press Inc, 2007

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	2	1	-	-	1	-	2	3	-	-
CO2	3	3	2	2	2	-	-	-	-	1	-	2	3	2	1
CO3	3	3	3	2	-	1	-	-	-	1	-	3	3	2	2
CO4	3	3	3	2	-	-	-	-	3-	1	-	3	3	3	3
CO5	3	3	3	3	3	1	1	1	1	2	2	3	3	3	3

Correlation levels: 1– low 2– medium 3 – high "-"-no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Sivaraja/Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

OPEN ELECTIVES

Category:OEC

U23CEO11 GREEN BUILDING L T P C

SDG: 9 3 0 0 3

COURSE OBJECTIVE :

1. To imbibe basics of green design and sustainable development concept.
2. To identify various area of implementing strategies for green design in projects to enhance built environment.
3. To learn institutional guidelines for development and certification of green designs.

UNIT 1 GREEN BUILDING CONCEPT 9

Overview of green building movement; Concept of Green building and sustainable development; Issues and strategies of Green building and sustainable development; Objectives Principals and Benefits of Green building design; Introduction to High performance building; integrated design process of high performance building; Green project requirements and strategies; Overview of various green rating systems worldwide

UNIT 2 GREEN BUILDING MATERIALS AND INDOOR ENVIRONMENT QUALITY 9

Introduction; Low emitting materials; Building and material reuse; Construction waste management; Regional materials; Life cycle cost assessment of building materials and products; Factors affecting indoor environment quality; Ventilation and filtration; Building materials and finishes- Emittance level; Indoor Environment quality best practice

UNIT 3 WATER: REDUCE, REUSE AND RECYCLE 9

Introduction; Waste water strategy and water reuse/recycling; Water fixtures and water use reduction strategies.

UNIT 4 ENERGY EFFICIENT DESIGNS 9

Passive cooling and day lighting- Active solar and photovoltaic- Building energy analysis methods-Building energy simulation- Building energy efficiency standards- Lighting system design- Lighting economics and aesthetics- Impacts of lighting efficiency- Energy audit and energy targetingTechnological options for energy management. Thermal comfort.

UNIT 5 IGBC GUIDELINES 9

Introduction; IGBC green new building Rating system – Overview and process – project checklist; Sustainable architecture and design; Site selection and planning; Water conservation and energy efficiency; Building materials and resources; Indoor Environment quality; Innovation and development

TOTAL : 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, students will be able to:

1. Demonstrate green concept skills and apply tools of Green building assessment.

2. Select appropriate green building material and technique.

3. Design sustainable and energy efficient civil engineering project.

4. Carry out Green Building rating using IGBC guidelines.

TEXT BOOKS

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995

2.Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997. 3. Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007

REFERENCE BOOKS

1.Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.

2.Sharma S.C. “Construction Equipment and Management”, Khanna Publishers New Delhi, 2002.

3. Deodhar, S.V. “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi, 2012

4. Mahesh Varma, “Construction Equipment and its Planning and Application”, Metropolitan Book Company, New Delhi, 1983

CO's-PO's & PSO's MAPPING															
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	2	1	-	-	2	3	-	-	1	-	1	3	2	2
CO2	2	3	2	2	2	-	3	3	-	-	-	1	1	3	3
CO3	2	2	3	2	-	3	3	-	-	-	-	1	2	3	3
CO4	2	3	3	3	2	-	-	-	-	-	-	-	2	1	-
CO5	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-
Correlation levels: 1– low 2– medium 3 – high "-"-no correlation															

COURSE DESIGNED BY	APPROVED BY
Dr.M.Vadivel/Associate Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CEO12 **NANO TECHNOLOGY** **L T P C**

SDG 9 **3 0 0 3**

UNIT 1 **INTRODCUTION** **9**

General definition and size effects–important nano structured materials and nano particlesimportance of nano materials- Size effect on thermal, electrical, electronic, mechanical, optical and magnetic properties of nanomaterials- surface area - band gap energy and applications. Photochemistry and Electrochemistry of nanomaterials –Ionic properties of nanomaterials- Nano catalysis.

UNIT 2 **SYNTHEIS OF NANO MATERIALS** **9**

Bottom up and Top-down approach for obtaining nano materials - Precipitation methods – sol gel technique – high energy ball milling, CVD and PVD methods, gas phase condensation, magnetron sputtering and laser deposition methods – laser ablation, sputtering

UNIT 3 **NANO COMPOSITES** **9**

Definition- importance of nanocomposites- nano composite materials-classification of compositesmetal/metal oxides, metal-polymer- thermoplastic based, thermoset based and elastomer basedinfluence of size, shape and role of interface in composites applications.

UNIT 4 **NANO STRUCTURES AND CHARACTERIZATIONNTECHNIQUES** **9**

Classifications of nanomaterials - Zero dimensional, one-dimensional and two-dimensional nanostructures- Kinetics in nanostructured materials- multilayer thin films and superlattice-clusters of metals, semiconductors and nanocomposites. Spectroscopic techniques, Diffraction methods, thermal analysis method, BET analysis method.

Classifications of nanomaterials - Zero dimensional, one-dimensional and two-dimensional nanostructures- Kinetics in nanostructured materials- multilayer thin films and superlattice-clusters of metals, semiconductors and nanocomposites. Spectroscopic techniques, Diffraction methods, thermal analysis method, BET analysis method.

UNIT 5 APPLICATION OF NANO MATERIALS 9

Overview of nanomaterials properties and their applications, nano painting, nano coating, nanomaterials for renewable energy, Molecular Electronics and Nanoelectronics – NanobotsBiological Applications. Emerging technologies for environmental applications-Practice of nanoparticles for environmental remediation and water treatment

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 understand the basic properties such as structural, physical, chemical properties of nanomaterials and their applications

2 able to acquire knowledge about the different types of nano material synthesis

3 describes about the shape, size, structure of composite nano materials and their interference

4 understand the different characterization techniques for nanomaterials

5 Develop a deeper knowledge in the application of nanomaterials in different fields

TEXT BOOKS

Mick Wilson, Kamali Kannangara,Geoff Smith, Michelle Simmom, Burkhard Raguse, " Nano Technology: Basic Science & Engineering Technology", 2005, Overseas Press

G. Cao, “Nanostructures & Nanomaterials: Synthesis, Properties &Applications” Imperial College Press, 2004

REFERENCE BOOKS

1. R.H.J.Hannink & A.J.Hill, Nanostructure Control, Wood Head Publishing Ltd.,Cambridge, 2006

2. C.N.R.Rao, A.Muller, A.K.Cheetham, The Chemistry of Nanomaterials: Synthesis, Properties and Applications Vol. I & II, 2nd edition, 2005, Wiley VCH Verlag Gibtl & Co

CO’s-PO’s & PSO’s MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2			1	1						3	2	2
CO2	3	3	2	2	1		1						3	3	2
CO3	2	2	3	2	2					1			2	2	3
CO4	2	3	3	3	2	2	2	2	2	2	1	2	3	3	3
CO5	2	3	3	3	2	2	2	1	1	2	2	2	3	3	3

Correlation levels: 1 – low 2 – medium 3 – high “-“- no correlation

COURSE DESIGNED BY	APPROVED BY
Mr.P.Siddharthan / Assistant Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman

U23CEO15 TRANSPORT AND ENVIRONMENT L T P C

SDG 9 3 0 0 3

COURSE OBJECTIVE:

The objective of this course is to create an awareness / overview of the impact of

Transportation Projects on the environment and society

UNIT 1 INTRODCUTION 9

Environmental Inventory, Environmental Assessment, Environmental Impact Assessment (EIA), Environmental Impact of Transportation Projects, Need for EIA, EIA Guidelines for Transportation Project, Historical Development.

UNIT 2 METHODOLOGIES 9

Elements of EIA – Screening and Scoping – Methods of Impact Analysis – Applications – Appropriate methodology.

UNIT 3 ENVIRONMENTAL IMPACT 9

Prediction and Assessment of Impact of Transportation Project at various stages on water, air, noise, land acquisition and resettlement, Socio economic impact, indigenous people, aesthetics, health and safety, energy studies, traffic impact studies, IRC guidelines

Prediction and Assessment of Impact of Transportation Project at various stages on water, air, noise, land acquisition and resettlement, Socio economic impact, indigenous people, aesthetics, health and safety, energy studies, traffic impact studies, IRC guidelines

UNIT 4 ENVIRONMENTAL MITIGATION AND MANAGEMENT PLAN 9

Mitigation of the impact on Natural and Man-made Environment, Health, Water, Land, Noise, Air, Public participation, Environmental Management Plan, Energy Conservation, Methods to reduce Global Warming..˙

Classifications of nanomaterials - Zero dimensional, one-dimensional and two-dimensional nanostructures- Kinetics in nanostructured materials- multilayer thin films and superlattice- clusters of metals, semiconductors and

nanocomposites. Spectroscopic techniques, Diffraction methods, thermal analysis method, BET analysis method.

UNIT 5 EIA CASE STUDIES 9

EIA Case Studies on Highway, Railway - EIA Case Studies on Transit Oriented Development (TOD), Compact Cities, Non-Motorised Transport (NMT)

TOTAL : 45 PERIODS

COURSE OUTCOMES

1	Understand the basic concepts of Environmental Impact of Assessment
2	Apply various methods of analyzing environmental Impact Analysis
3	Gain knowledge on Stage Wise Assessment and Prediction of impact of transportation projects
4	Adopt environmental management plan and their impact on earth
5	Reviewing various case studies on environmental impact assessment of transport projects

TEXT BOOKS

Canter, L.R., Environmental Impact Assessment, McGraw Hill, New Delhi, 1996

G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties &Applications" Imperial College Press, 2004

REFERENCE BOOKS

1. John G.Rau and David, C.Hooten, Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1995
2. James H.Banks, Introduction to Transportation Engineering, McGraw Hill Book Company, 2000

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1		2	2			1	1						3	2	2
CO2		3	2	2	1		1						3	3	2
CO3	2			2	2					1			2	2	3
CO4	2	3	2	3	2	2	2	2	2	2	1	2	3	3	3
CO5		3	3	3	2	2	2	1	1	2	2	2	3	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Mrs.S.Brindha/ Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

U23CEO16 DRINKING WATER SUPPLY AND TREATMENT L T P C

SDG 9 3 0 0 3

COURSE OBJECTIVE:

To equip the students with the principles and design of water treatment units and distribution system

UNIT 1 SOURCES OF WATER 9

Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards..

UNIT 2 CONVEYANCE FROM THE SOURCE 9

Water supply – intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.

UNIT 3 WATER TREATMENT 9

Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation –- sand filters - Disinfection -– Construction, Operation and Maintenance aspects.

Prediction and Assessment of Impact of Transportation Project at various stages on water, air, noise, land acquisition and resettlement, Socio economic impact, indigenous people, aesthetics, health and safety, energy studies, traffic impact studies, IRC guidelines

UNIT 4 ADVANCED WATER TREATMENT 9

Water softening – Desalination- R.O. Plant – demineralization – Adsorption - Ion exchange– Membrane Systems - Iron and Manganese removal - Defluoridation - Construction and Operation and Maintenance aspects..˙

Classifications of nanomaterials - Zero dimensional, one-dimensional and two-dimensional nanostructures- Kinetics in nanostructured materials- multilayer thin films and superlattice- clusters of metals, semiconductors and nanocomposites. Spectroscopic techniques, Diffraction methods, thermal analysis method, BET analysis method.

UNIT 5 WATER DISTRIBUTION AND SUPPLY 9

Requirements of water distribution – Components – Selection of pipe material – Service reservoirs - Functions – Network design – Economics - Computer applications –

Appurtenances – Leak detection - Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 an understanding of water quality criteria and standards, and their relation to public health

2 the ability to design the water conveyance system

3 the knowledge in various unit operations and processes in water treatment

4 an ability to understand the various systems for advanced water treatment

5 an insight into the structure of drinking water distribution system

TEXT BOOKS

Garg. S.K., "Water Supply Engineering", Khanna Publishers, Delhi, September 2008

Punmia B.C, Arun K.Jain, Ashok K.Jain, " Water supply Engineering" Lakshmi publication private limited, New Delhi, 2016.

REFERENCE BOOKS

1. Fair. G.M., Geyer.J.C., "Water Supply and Wastewater Disposal", John Wiley and Sons, 1954.
2. Babbit.H.E, and Donald.J.J, "Water Supply Engineering" , McGraw Hill book Co, 1984.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1		2	2			1	1			3			3	2	2
CO2		3	2				1			2			3	3	2
CO3										1			2	2	3
CO4		3	2						2	2	1	2	3	3	3
CO5		3	3						1	2	2	2	3	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation	
COURSE DESIGNED BY	**APPROVED BY**
Mrs.JK Sowmiya/ Assistant Professor Department of Civil Engineering	**Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering**
Name and Department	**Name and Department of BoS Chairman**

Category :OEC

U23CEO13 **FIRE SAFETY ENGINEERING** **L T P C**

SDG 9 **3 0 0 3**

COURSE OBJECTIVE :

1. Understand the basic principles of fire, combustion, and heat transfer mechanisms.
2. Learn the fire safety design principles, fire protection systems, and fire-resistant materials.
3. Acquire knowledge of detection, alarm, and extinguishing systems.
4. Understand building codes and standards related to fire safety.

5. Apply fire prevention and control measures in design and maintenance of buildings and industries

UNIT 1 FUNDAMENTALS OF FIRE AND COMBUSTION 9

Nature and chemistry of fire – Fire triangle and tetrahedron – Heat transfer (conduction, convection, radiation) - Ignition sources and fire development – Classification of fuels and fires - Fire behavior in buildings – Flame spread, flashover, backdraft, and smoke movement - Effects of fire on structures and occupants

UNIT 2 FIRE SAFETY DESIGN AND MATERIALS 9

Fire-resisting materials and construction – Fire performance of building materials - Design for compartmentation, smoke control, and structural stability - Fire safety in building planning – Escape routes, exits, and means of egress - Fire rating of components – Fire doors, walls, floors, and ceilings

UNIT 3 FIRE DETECTION, ALARM, AND SUPPRESSION SYSTEMS 9

Fire detection and alarm systems – Heat, smoke, and flame detectors - Manual call points, alarm panels, and public address systems - Portable extinguishers – Types and suitability (water, foam, CO_2, dry powder, clean agent) - Fixed fire suppression systems – Sprinklers, standpipe, hydrant systems, and gaseous suppression.

UNIT 4 FIRE SAFETY MANAGEMENT AND PREVENTION 9

Fire safety planning – Fire drills, evacuation plans, signage, and training - Fire risk assessment and safety audit - Industrial fire safety and electrical fire prevention - Role of Fire Service Department and emergency response coordination.

UNIT 5 FIRE SAFETY LEGISLATION AND CODES 9

National Building Code (NBC Part 4: Fire and Life Safety) – Overview and application - BIS codes related to fire protection (IS 2190, IS 2189, IS 1641, IS 1642, IS 3844, etc.). - Fire safety regulations in high-rise and industrial buildings - Case studies on major fire accidents and lessons learned.

TOTAL : 45 PERIODS

COURSE OUTCOMES

1 Explain the fundamental principles of fire behavior and combustion processes.

2 Apply fire safety design principles and select appropriate fire-resistant materials.

3 Identify and operate suitable fire detection, alarm, and suppression systems.

4 Develop fire safety management and emergency response plans.

5 Interpret and implement fire safety codes, standards, and legal requirements.

TEXT BOOKS

1. Khanna, S.K., Fire Safety in Buildings, Khanna Publishers, New Delhi, 2020.

2. Jain, V.K., Fire Safety Engineering, CBS Publishers & Distributors, New Delhi, 2021.

REFERENCE BOOKS

1. National Building Code of India (NBC) – Part 4: Fire and Life Safety, BIS, Latest Edition.

2. Drysdale, D., An Introduction to Fire Dynamics, 3rd Edition, Wiley, 2011.

3. Hurley, M.J., SFPE Handbook of Fire Protection Engineering, 5th Edition, Springer, 2016.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2			1	1						3	2	2
CO2	3	3	2	2	1		1						3	3	2
CO3	2	2	3	2	2					1			2	2	3
CO4	2	3	3	3	2	2	2	2	2	2	1	2	3	3	3
CO5	2	3	3	3	2	2	2	1	1	2	2	2	3	3	3

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

COURSE DESIGNED BY	APPROVED BY
Dr.M.Samuel Thanaraj / Associate Professor Department of Civil Engineering	Dr.M.Samuel Thanaraj/Associate Professor Department of Civil Engineering
Name and Department	Name and Department of BoS Chairman