SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Puducherry

B.TECH.

CIVIL ENGINEERING

ACADEMIC REGULATIONS 2023
(R - 2023)

CURRICULUM

COLLEGE VISION AND MISSION

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

Mission

M1: QUALITY EDUCATION

To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

M2: RESEARCH AND INNOVATION

To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3: EMPLOYABILITY AND ENTREPRENEURSHIP

To inculcate the employability and entrepreneurial skills through value and skill based training.

M4: ETHICAL VALUES

To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

DEPARTMENT VISION AND MISSION

Vision

We envision a world where the civil engineering department will be a home to an intellectual community with good quality education embedded with practical knowledge by inculcating research, strong social commitment and ethical values from its students, staffs and alumni.

Mission

M1: QUALITY EDUCATION

To fulfill the requirements of construction industry, Civil Engineering profession and rural community through dissemination of technical services.

M2: PRACTICAL KNOWLEDGE

To impart quality and real-time education to the students with the knowledge & skills needed for Civil Engineering practice

M3: WORK EFFICIENCY

To encourage research, development and consultancy through sustained interaction with industry & research organization.

M4: SOCIETAL ISSUES

To develop graduates to compete at the global level to deal with modern issues.

M5: MORAL & ETHICAL

To insist ethical values and professionalism among the students.

PROGRAMME OUTCOMES (POs)

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, research literature, and analyze 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 modeling 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.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Fundamental Knowledge

To gain a thorough fundamental knowledge, problem solving skills, engineering experimental abilities, and design capabilities for a civil engineering career.

PEO2: Knowledge and Skills

To establish the knowledge and skills necessary for identifying and assessing design alternatives and the related social, economic, environmental, and public safety impacts.

PEO 3: Societal Implications

To develop the ability to deal effectively with ethical and professional issues, taking into account the broader societal implications of civil engineering

PEO 4: Competent Professionals

To create competent professionals who are trained in the design and development of Civil Engineering systems to engulf research and development activities

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Practical Knowledge

Inculcating practical knowledge in planning, analysis, design and construction management without much exploiting natural resources.

PSO 2: Critical Thinking

Imparting effective communicational skills, leadership attributes towards the team work and developing critical thinking abilities to find solutions for civil engineering problems of multi-disciplinary nature.

PSO 3: Challenging Employment

Ability to take up any challenging employment, entrepreneurship, research and development for sustainable civil society as a civil engineering graduate.

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM

Sl. No	Course Category	Breakdown of Credits
1	Humanities and Social Sciences including Management courses (HS)	15
2	Basic Science Courses (BS)	20
3	Engineering Science including workshop, drawing, basics of electrical / mechanical / computer etc. (ES)	28
4	Professional Core Courses (PC)	66
5	Professional Electives Courses (PE)	18
6	Open Electives Courses (OE)	9
7	Project Work and Internship (PA)	13
8	Ability Enhancement Courses (AEC*)	0
9	Mandatory Courses (MC*)	0
Total		**169**

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl.No	AICTE Suggested Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Science (HS)	3	5	1	1	2	-	-	3	15
2	Basic Sciences(BS)	7	4	5	4	-	-	-	-	20
3	Engineering Sciences (ES)	11	5	4	4	4	-	-	-	28
4	Professional Core (PC)	1	7	13	10	8	15	12	-	66
5	Professional Electives (PE)	-	-	-	3	3	3	3	6	18
6	Open Electives (OE)	-	-	-	-	3	3	3	-	9
7	Project Work (PA)	-	-	-	-	1	1	2	8	12
8	Internship (PA)	-	-	-	-	-	-	1	-	1
9	Ability Enhancement Courses (AEC*)	-	-	-	-	-	-	-	-	0
10	Mandatory courses (MC*)	-	-	-	-	-	-	-	-	0
Total		**22**	**21**	**23**	**22**	**21**	**22**	**21**	**17**	**169**

**** AEC and MC are not included for CGPA calculation***

SEMESTER – I										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC01	Engineering Mathematics - I	BS	3	1	0	4	25	75	100
2	U23BSTC01	Physical Science for Engineers	BS	3	0	0	3	25	75	100
3	U23ESTC01	Basics of Civil and Mechanical Engineering	ES	3	0	0	3	25	75	100
4	U23ESTC02	Engineering Mechanics	ES	2	1	0	3	25	75	100
5	U23ESTC03	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ENBC01	Communicative English I	HS	2	0	2	3	50	50	100
Practical										
7	U23ESPC01	Basics of Electrical and Electronics Engineering Laboratory	ES	0	0	2	1	50	50	100
8	U23ESPC02	Design Thinking and IDEA Lab	ES	0	0	2	1	50	50	100
9	U23CEP101	Civil Engineering Practice Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CEC1XX	Certification Course – I**	AEC	0	0	4	-	100	-	100
Mandatory Course										
11	U23CEM101	Induction Programme	MC	2 Weeks			-	-	-	-
							22	425	575	1000

***** Certification courses are to be selected from the list given in Annexure III***

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC02	Engineering Mathematics - II	BS	3	1	0	4	25	75	100
2	U23CSTC01	Programming in C	ES	3	0	0	3	25	75	100
3	U23CET201	Mechanics of Solids - I	PC	3	0	0	3	25	75	100
4	U23CET202	Building Materials and Construction	PC	3	0	0	3	25	75	100
5	U23HSTC01	Universal Human Values - II	HS	2	0	0	2	25	75	100
Theory cum Practical										
6	U23ENBC02	Communicative English II	HS	2	0	2	3	50	50	100
Practical										
7	U23CSPC01	Programming in C Laboratory	ES	0	0	2	1	50	50	100
8	U23ESPC03	Engineering Graphics using AutoCAD	ES	0	0	2	1	50	50	100
9	U23CEP202	Strength of Materials Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CEC2XX	Certification Course – II**	AEC	0	0	4	0	100	-	100
Mandatory Course										
11	U23CEM202	Sports Yoga and NSS	MC	0	0	2	0	100	-	100
							21	525	575	1100

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC03	Probability and Statistics	BS	3	1	0	4	25	75	100
2	U23ADTC01	Programming in Python	ES	3	0	0	3	25	75	100
3	U23CET303	Fluid Mechanics and Machinery	PC	3	0	0	3	25	75	100
4	U23CET304	Construction Technique, Equipment and Practices	PC	3	0	0	3	25	75	100
5	U23CET305	Mechanics of Solids-II	PC	3	0	0	3	25	75	100
Theory cum Practical										
6	U23CEB301	Surveying and Geomatics	PC	2	0	2	3	50	50	100
Practical										
7	U23ENPC01	General Proficiency I	HS	0	0	2	1	50	50	100
8	U23MAPC01	Engineering Mathematics Laboratory	BS	0	0	2	1	50	50	100
9	U23ADPC01	Programming in Python Laboratory	ES	0	0	2	1	50	50	100
10	U23CEP303	Fluid Mechanics and Machines Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23CEC3XX	Certification Course – III**	AEC	0	0	4	0	100	-	100
12	U23CES301	Skill Enhancement Course - I*	SEC	0	0	2	0	100	-	100
Mandatory Course										
13	U23CEM303	Climate Change	MC	2	0	0	0	100	-	100
							23	675	625	1300

**** Skill Development Courses are to be selected from the list given in Annexure IV***

SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC04	Numerical Methods and Optimization	BS	3	1	0	4	25	75	100
2	U23CSTC03	Data Structures	ES	3	0	0	3	25	75	100
3	U23CET406	Soil Mechanics	PC	2	1	0	3	25	75	100
4	U23CET407	Design of RC Elements	PC	2	1	0	3	25	75	100
5	U23CEE4XX	Professional Elective - I#	PE	3	0	0	3	25	75	100
Theory cum Practical										
6	U23CEB402	Concrete Technology	PC	2	0	2	3	50	50	100
Practical										
7	U23ENPC02	General Proficiency II	HS	0	0	2	1	50	50	100
8	U23CSPC02	Data Structures Laboratory	ES	0	0	2	1	50	50	100
9	U23CEP404	Geotechnical Engineering Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CEC4XX	Certification Course – IV**	AEC	0	0	4	0	100	-	100
11	U23CES402	Skill Enhancement Course - II*	SEC	0	0	2	0	100	-	100
Mandatory Course										
12	U23CEM404	Right to Information and Good Governance	MC	2	0	0	0	100	-	100
							22	625	575	1200

Professional Electives are to be selected from the list given in Annexure I

SEMESTER – V										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HSTC02	Research Methodology	HS	2	0	0	2	25	75	100
2	U23ITTC02	Programming in Java	ES	3	0	0	3	25	75	100
3	U23CET508	Foundation Engineering	PC	3	0	0	3	25	75	100
4	U23CET509	Water supply and Wastewater Engineering	PC	3	0	0	3	25	75	100
5	U23CEE5XX	Professional Elective - II[#]	PE	3	0	0	3	25	75	100
6	U23XXO5XX	Open Elective – I[$]	OE	3	0	0	3	25	75	100
Practical										
7	U23ITPC02	Programming In Java Laboratory	ES	0	0	2	1	50	50	100
8	U23CEP505	Water and Wastewater Engineering Laboratory	PC	0	0	2	1	50	50	100
9	U23CEP506	REVIT Architecture Laboratory	PC	0	0	2	1	50	50	100
Project Work										
10	U23CEW501	Micro Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23CEC5XX	Certification Course – V**	AEC	0	0	4	0	100	-	100
Mandatory Course										
12	U23CEM505	Essence of Indian Traditional Knowledge	MC	2	0	0	0	100	-	100
							21	600	600	1200

[$]***Open electives are to be selected from the list given in Annexure II***

SEMESTER – VI										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23CET610	Design of Steel Structures	PC	3	0	0	3	25	75	100
2	U23CET611	Structural Analysis	PC	3	0	0	3	25	75	100
3	U23CET612	Transportation Engineering	PC	3	0	0	3	25	75	100
4	U23CEE6XX	Professional Elective - III#	PE	3	0	0	3	25	75	100
5	U23XXO6XX	Open Elective – II$	OE	3	0	0	3	25	75	100
Theory cum Practical										
6	U23CEB603	Instrumentation and sensor Technologies for Civil Engineering Application	PC	2	0	2	3	50	50	100
Practical										
7	U23CEP607	STAAD PRO V8i Laboratory	PC	0	0	2	1	50	50	100
8	U23CEP608	Transportation Engineering Laboratory	PC	0	0	2	1	50	50	100
9	U23CEP609	Survey Camp	PC	0	0	0	1	50	50	100
Project Work										
10	U23CEW602	Mini Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23CEC6XX	Certification Course – VI**	AEC	0	0	4	0	100	-	100
Mandatory Course										
12	U23CEM606	Gender Equality	MC	2	0	0	0	100	-	100
							22	625	575	1200

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23CET713	Construction Technology and Management	PC	3	0	0	3	25	75	100
2	U23CET714	Hydrology and Water Resource Engineering	PC	3	0	0	3	25	75	100
3	U23CET715	Prefabricated Structures	PC	3	0	0	3	25	75	100
4	U23CEE7XX	Professional Elective – IV[#]	PE	3	0	0	3	25	75	100
5	U23XXO7XX	Open Elective – III[$]	OE	3	0	0	3	25	75	100
Practical										
6	U23CEP710	Simulation Software Laboratory	PC	0	0	2	1	50	50	100
7	U23CEP711	Estimation Costing and Valuation Engineering	PC	0	0	2	1	50	50	100
8	U23CEP712	Modelling and Analysis Laboratory	PC	0	0	2	1	50	50	100
Project Work										
9	U23CEW703	Project Phase – I	PA	0	0	4	2	50	50	100
10	U23CEW704	Internship / Inplant Training	PA	0	0	2	1	100	-	100
							21	425	575	1000

SEMESTER – VIII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HSTC03	Entrepreneurship and Business Management	HS	3	0	0	3	25	75	100
2	U23CEE8XX	Professional Elective – V[#]	PE	3	0	0	3	25	75	100
3	U23CEE8XX	Professional Elective – VI[#]	PE	3	0	0	3	25	75	100
Project Work										
4	U23CEW805	Project Phase – II	PA	0	0	16	8	50	100	150
							17	125	325	450

Annexure – I
PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)		
SL. NO.	COURSE CODE	COURSE TITLE
1	U23CEE401	Composite Structures
2	U23CEE402	Environmental Law and Policy
3	U23CEE403	Building Services
4	U23CEE404	Remote Sensing and GIS
5	U23CEE405	Alternative Building Materials and Technologies
Professional Elective – II (Offered in Semester V)		
SL. NO.	COURSE CODE	COURSE TITLE
1	U23CEE506	Advanced Design of RCC Structures
2	U23CEE507	Air and Noise Pollution
3	U23CEE508	Sustainable and Lean Construction
4	U23CEE509	Airport and Harbor Engineering
5	U23CEE510	Green Building Technology
Professional Elective – III (Offered in Semester VI)		
SL. NO.	COURSE CODE	COURSE TITLE
1	U23CEE611	Advanced Structural Analysis
2	U23CEE612	Pollution Control and Monitoring
3	U23CEE613	Buildings Codes and Requirement
4	U23CEE614	Traffic engineering and Management
5	U23CEE615	Urban Planning and Development
Professional Elective – IV (Offered in Semester VII)		
SL. NO.	COURSE CODE	COURSE TITLE
1	U23CEE716	Structural Health Monitoring
2	U23CEE717	Municipal Solid Waste Management
3	U23CEE718	Quality Control and assurance in Construction
4	U23CEE719	Tunneling Engineering
5	U23CEE720	Architecture and Town Planning
Professional Elective – V (Offered in Semester VIII)		
SL. NO.	COURSE CODE	COURSE TITLE
1	U23CEE821	Precast Structures
2	U23CEE822	Industrial Waste Disposal and Treatment
3	U23CEE823	Construction Safety
4	U23CEE824	Intelligent Transport System
5	U23CEE825	Interior Design
Professional Elective – VI (Offered in Semester VIII)		
SL. NO.	COURSE CODE	COURSE TITLE
1	U23CEE826	Pre- Stressed Concrete Structures
2	U23CEE827	Environmental Impact Assessment
3	U23CEE828	Natural Disaster and Mitigation
4	U23CEE829	Bridge Engineering
5	U23CEE830	Smart City

Annexure – II
OPEN ELECTIVE COURSES OFFERED BY CIVIL ENGINEERING

S. No	Course Code	Course Title
OPEN ELECTIVE – I		
1	U23CEOC01	Energy and Environment
2	U23CEOC02	Energy Efficient Building
OPEN ELECTIVE – II		
1	U23CEOC03	Disaster Management
2	U23CEOC04	Air Pollution and Solid Waste Management

OPEN ELECTIVE COURSES OFFERED BY OTHER DEPARTMENT

S. No.	Course Code	Course Title	Offering Department	Permitted Departments
OPEN ELECTIVE – I (OFFERED IN SEMESTER V/VI)				
1	U23EEDC01	Electrical Safety Engineering	EEE	ECE, ICE, MECH, CIVIL, MCTR, CCE, BME, IT, CSE, FT, AI&DS, CSBS
2	U23EEOC02	Solar Photovoltaic Fundamental and Applications	EEE	ECE, ICE, MECH, CIVIL, MCTR, CCE, BME, IT, CSE, FT, AI&DS, CSBS
3	U23ECOC01	Engineering Computation with MATLAB	ECE	EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS, Mechatronics
4	U23ECOC02	Consumer Electronics	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics, FT
5	U23CSOC01	Structured Query Language	CSE	ECE, EEE, ICE, MECH, CIVIL, BME and MECHTRONICS
6	U23CSOC02	Computer Peripherals and Networking	CSE	Offered to all Branches
7	U23ITOC01	Database System: Design & Development	IT	EEE, ECE, ICE, BME, MECH, CIVIL, MECHATRONICS
8	U23ITOC02	Computer Hardware and Troubleshooting	IT	EEE, ECE, ICE, CCE, BME, MECH,

S. No.	Course Code	Course Title	Offering Department	Permitted Departments
				MECHATRONICS
9	U23MEOC01	Rapid Prototyping	MECH	EEE, ECE, ICE, CIVIL, BME, FT
10	U23MEOC02	Material Handling System	MECH	EEE, ICE, CIVIL, Mechatronics
11	U23CEOC01	Energy and Environment	CIVIL	EEE, ECE, MECH, BME, IT, Mechatronics
12	U23CEOC02	Energy Efficient Buildings	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS
13	U23ICOC01	Sensors and Transducers	ICE	EEE, ECE, CSE, IT, MECH, CIVIL, CCE, CSBS, AI&DS
14	U23ICOC02	Instrumentation for Industry 4.0	ICE	EEE, ECE, CSE, IT, MECH, CIVIL, CCE, CSBS, AI&DS, Mechatronics
15	U23BMOC01	Medical Electronics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics, AI&DS
16	U23BMOC02	Telemedicine	BME	EEE, ECE, CSE, IT, ICE, CCE, AI&DS
17	U23CCOC01	Introduction to Communication Technologies	CCE	EEE, MECH, CSE, IT, CIVIL, ICE, Mechatronics, BME, AIDS
18	U23CCOC02	Introduction to Computer Networks	CCE	EEE, MECH, CIVIL, ICE, Mechatronics, BME, AIDS
19	U23CBOC01	Business Applications of Game Theory	CSBS	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME, CCE
20	U23CBOC02	Cryptology and Analysis	CSBS	EEE, MECH, CIVIL, ICE, Mechatronics, BME
21	U23ADDC01	Principles of Artificial Intelligence and Machine Learning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
22	U23ADOCO2	Introduction to Data Science	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics,
23	U23MCDC01	Automation in Manufacturing systems	MCTR	EEE, MECH&ICE

S. No.	Course Code	Course Title	Offering Department	Permitted Departments
24	U23MCDC02	Building Automation	MCTR	MECH, EEE, ECE&ICE
25	U23FTOC01	Textile Arts and Crafts	FT	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics, AI&DS
26	U23FTOC02	Garment Manufacturing Technology	FT	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics, AI&DS
OPEN ELECTIVE – II (OFFERED IN SEMESTER VII)				
1	U23EEOC03	Electric and Hybrid Vehicles	EEE	ECE, ICE, MECH, MCTR, CCE, BME, AI&DS
2	U23EEOC04	Energy Conservation and Management	EEE	ECE, ICE, MECH, CIVIL, MCTR, CCE, BME, IT, CSE, AI&DS
3	U23ECOC03	IoT and its Applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, FT
4	U23ECOC04	RFID System Design and Testing	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics
5	U23CSOC03	Web Programming	CSE	ECE, EEE, ICE, MECH, CIVIL, BME AND MECHTRONICS
6	U23CSOC04	Cloud Technology	CSE	ECE, EEE, ICE, MECH, CIVIL, BME and MECHTRONICS
7	U23ITOC03	Essentials of Data Science	IT	EEE, ECE, ICE, CSE, MECH, CIVIL, CCE, BME, MECHATRONICS
8	U23ITOC04	Big Data Technologies	IT	EEE, ICE, MECH, CIVIL, CCE, BME
9	U23MEOC03	Creativity Innovation and New Product Development	MECH	EEE, ECE, ICE, CIVIL, BME,Mechatronics
10	U23MEOC04	Supply Chain Management	MECH	EEE, ECE, CIVIL, Mechatronics
11	U23CEOC03	Disaster Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS
12	U23CEOC04	Air Pollution and Solid Waste Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS

S. No.	Course Code	Course Title	Offering Department	Permitted Departments
13	U23ICOC03	Fuzzy Logic and Neural Networks	ICE	CSE, IT, MECH, CSBS, AI&DS, Mechatronics
14	U23ICOC04	Industrial Automation	ICE	ECE, CSE, IT, MECH, CCE, CSBS, AI&DS
15	U23BMOC03	Medical Robotics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics, AI&DS
16	U23BMOC04	Telehealth Technology	BME	EEE, ECE, ICE, CCE
17	U23CCOC03	Web App Development	CCE	EEE, ECE, MECH, CSE, IT, CIVIL, ICE, Mechatronics, BME, AIDS
18	U23CCOC04	Network Essentials and Security	CCE	EEE, MECH, CSE, IT, CIVIL, ICE, Mechatronics, BME, AIDS
19	U23CBOC03	Engineering Economics	CSBS	EEE, ECE, CSE, IT, MECH, CIVIL, ICE, Mechatronics, BME, AIDS, CCE, FT
20	U23CBOC04	Conversational AI	CSBS	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
21	U23ADOC03	Data science Application of Vision	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE
22	U23ADOC04	Artificial Intelligence Applications	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
23	U23MCDC03	Non-Destructive Testing	MCTR	MECH, EEE, ECE&ICE
24	U23MCOC04	Robots and Systems in Smart Manufacturing	MCTR	MECH, EEE, ECE&ICE
25	U23FTOC03	Fundamentals of Fashion Design	FT	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics, AI&DS
26	U23FTOC04	Pattern Making	FT	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics, AI&DS

S. No.	Course Code	Course Title	Offering Department	Permitted Departments
OPEN ELECTIVE – I / OPEN ELECTIVE – II/ OFFERED IN SEMESTER V/VI				
S.No	**Course Code**	**Course Title**	**Offering Department**	**Permitted Departments**
1	U23HSOC01	Intellectual Property Rights	MBA	(Offered in Semester V for EEE, ECE, ICE, CIVIL, BME, CCE, FT)
2	U23HSOC02	New Product Development		
3	U23HSOC03	Finance for Engineers		
4	U23HSOC04	Economics for Engineers		(Offered in Semester VI for CSE, IT, MECH, Mechatronics, AI&DS)
5	U23HSOC05	Marketing Management		

ANNEXURE -III

ABILITY ENHANCEMENT COURSES – CERTIFICATION COURSES

Semester	Course Code	R-2023 Course Title
I	U23CEC107	Autodesk AutoCAD - ACU
II	U23CEC248	Sketch Up
III	U23CEC360	Total Station
IV	U23CEC430	Fundamentals of Internet of Things
V	U23CEC511	Autodesk 3ds Max -ACU
VI	U23CEC656	MX Road

ANNEXURE - IV

SKILL ENHANCEMENT COURSES

Sl. No	Course Code	Course Title
1	U23CES301	**Skill Enhancement Course - I**
		1) Basic Vasthu
		2) Plane Table Surveying
		3) Auto level surveying
2	U23CES402	**Skill Enhancement Course - II**
		1) MS Office – Word, Excel, Power Point
		2) Measurements and Conversion
		3) Traditional construction in modern age

NPTEL COURSE LIST

Sl.No.	List of Subjects
1	Geosynthetics and Reinforced Soil Structures
2	Principles of Construction Management
3	Introductory Field Structural Geology
4	Geotechnical Earthquake Engineering
5	Finite Element Method and Computational Structural Dynamics
6	Underground Space Technology
7	Environmental Chemistry
8	Sustainable Transportation Systems
9	Environmental Modeling and Simulation
10	Pavement Materials (Under Pavement Engineering)
11	Advanced Geomatics Engineering
12	Geometric Design of Highways
13	Plate Tectonics
14	Introduction to Engineering Seismology
15	Remote Sensing: Principles and Applications
16	Geotechnical Engineering - II
17	Environmental Geomechanics
18	Advanced Concrete Technology

Sl.No.	List of Subjects
19	Geotechnical Engineering Laboratory
20	Dynamics of Structures
21	Mechanics of Solids
22	Structural Geology
23	Reliability-Based Structural Design
24	River Engineering
25	Optimization Methods for Civil Engineering
26	Subsurface Exploration: Importance And Techniques Involved
27	Remote Sensing and GIS
28	Municipal Solid Waste Management
29	Fluid Mechanics
30	Bridge Engineering
31	Introduction to Multimodal Urban Transportation Systems (MUTS)
32	Rock Mechanics and Tunneling
33	Ground Improvement
34	Wastewater Treatment and Recycling
35	Sustainable Engineering Concepts and Life Cycle Analysis
36	Global Navigation Satellite Systems and Applications
37	Soil Mechanics/Geotechnical Engineering I
38	Railway Engineering
39	Geo Engineering
40	Earth Sciences for Civil Engineering Part - I & II
41	Foundation Engineering
42	Design Of Steel Structures

MOOC COURSE LIST

Sl.No.	List of Subjects
1	Construction Project Management
2	Python fundamentals for beginners
3	Risk and safety in civil engineering
4	Energy literacy training
5	Architecture urban design
6	Autodesk certified professional: AutoCAD for Design and Drafting exam prep
7	Transportation, Sustainable Buildings, Green Construction
8	AI for everyone: Master the basics
9	Python Basics for Data Science
10	Introduction to Engineering Mechanics
11	Construction Project Management
12	Python fundamentals for beginners

Sl.No.	List of Subjects
13	Risk and safety in civil engineering
14	Energy literacy training
15	Architecture urban design
16	Autodesk certified professional: AutoCAD for Design and Drafting exam prep
17	Transportation, Sustainable Buildings, Green Construction
18	AI for everyone: Master the basics
19	Python Basics for Data Science
20	Introduction to Engineering Mechanics

EMPLOYABILITY ENHANCEMENT COURSES – (A) CERTIFICATION COURSES

Sl. No.	Course Code	Course Title
1	U23MCCX01	3ds Max
2	U23MCCX02	Advance Structural Analysis of Building using ETABS
3	U23MCCX03	Advanced Java Programming
4	U23MCCX04	Advanced Python Programming
5	U20MCCX05	Analog System Lab Kit
6	U23MCCX06	Android Medical App Development
7	U23MCCX07	Android Programming
8	U23MCCX08	ANSYS -Multiphysics
9	U23MCCX09	Artificial Intelligence
10	U23MCCX10	Artificial Intelligence and Edge Computing
11	U23MCCX11	Artificial Intelligence in Medicines
12	U23MCCX12	AutoCAD for Architecture
13	U20MCCX13	AutoCAD for Civil
14	U23MCCX14	AutoCAD for Electrical
15	U23MCCX15	AutoCAD for Mechanical
16	U23MCCX16	Azure DevOps

Sl. No.	Course Code	Course Title
17	U23MCCX17	Basic Course on ePLAN
18	U23MCCX18	Basic Electro Pneumatics
19	U23MCCX19	Basic Hydraulics
20	U23MCCX20	Bio Signal and Image Processing Development System
21	U23MCCX21	Blockchain
22	U23MCCX22	Bridge Analysis
23	U20MCCX23	Building Analysis and Construction Management
24	U23MCCX24	Building Design and Analysis Using AECO Sim Building Designer
25	U23MCCX25	CATIA
26	U23MCCX26	CCNA (Routing and Switching)
27	U23MCCX27	CCNA (Wireless)
28	U23MCCX28	Cloud Computing
29	U23MCCX29	Computer Programming for Medical Equipments
30	U23MCCX30	Corel Draw
31	U23MCCX31	Creo (Modeling and Simulation)
32	U23MCCX32	Cyber Security
33	U23MCCX33	Data Science and Data Analytics
34	U23MCCX34	Data Science using Python
35	U23MCCX35	Data Science using R
36	U23MCCX36	Deep Learning
37	U23MCCX37	Design and Documentation using ePLAN Electric P8
38	U23MCCX38	Design of Biomedical Devices and Systems
39	U23MCCX39	Digital Marketing
40	U23MCCX40	Digital Signal Processing Development System
41	U23MCCX41	DigSILENT Power Factory
42	U23MCCX42	Electro Hydraulic Automation with PLC

Sl. No.	Course Code	Course Title
43	U23MCCX43	Embedded System using Arduino
44	U23MCCX44	Embedded System using C
45	U23MCCX45	Embedded System with IoT
46	U23MCCX46	ePLAN Data Portal
47	U23MCCX47	ePLAN Electric P8
48	U23MCCX48	ePLAN Fluid
49	U23MCCX49	ePLAN PPE
50	U23MCCX50	Fusion 360
51	U23MCCX51	Fuzzy Logic and Neural Networks
52	U23MCCX52	Google Analytics
53	U23MCCX53	Hydraulic Automation
54	U23MCCX54	Industrial Automation
55	U23MCCX55	Industry 4.0
56	U23MCCX56	Internet of Things
57	U23MCCX57	Introduction to C Programming
58	U23MCCX58	Introduction to C++ Programming
59	U23MCCX59	IoT using Python
60	U23MCCX60	Java Programming
61	U23MCCX61	Machine Learning
62	U23MCCX62	Machine Learning and Deep Learning
63	U23MCCX63	Machine Learning for Medical Diagnosis
64	U23MCCX64	Mechatronics
65	U23MCCX65	Medical Robotics
66	U23MCCX66	Microsoft Dynamics 365 ERP for HR , Marketing and Finance
67	U23MCCX67	Mobile Edge Computing
68	U23MCCX68	Modeling and Visualization using Micro station

Sl. No.	Course Code	Course Title
69	U23MCCX69	MX Road
70	U23MCCX70	Photoshop
71	U23MCCX71	PLC
72	U23MCCX72	Pneumatics Automation
73	U23MCCX73	Project Management
74	U23MCCX74	Python Programming
75	U23MCCX75	Revit Architecture
76	U23MCCX76	Revit Inventor
77	U23MCCX77	Revit MEP
78	U23MCCX78	Robotics
79	U23MCCX79	Search Engine Optimization
80	U23MCCX80	Software Testing
81	U23MCCX81	Solar and Smart Energy System with IoT
82	U23MCCX82	Solid Works
83	U23MCCX83	Solid Works with Electrical Schematics
84	U23MCCX84	Speech Processing
85	U23MCCX85	STAAD PRO V8i
86	U23MCCX86	Structural Design and Analysis using Bentley
87	U23MCCX87	Total Station
88	U23MCCX88	Video and Image Processing Development System
89	U23MCCX89	VLSI Design
90	U23MCCX90	Web Programming - I
91	U23MCCX91	Web Programming - II

SEMESTER I

Department	**Mathematics**		Programme: **B.Tech.**					
Semester	**I**		Course Category Code: **BS**			End Semester Exam Type: **TE**		
Course Code	**U23MATC01**		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Mathematics – I**		**3**	**1**	**0**	**4**	**25**	**75**	**100**
(Common to ALL Branches Except CSBS)									
Prerequisite	Basic Mathematics								
Course Outcome	**On completion of the course, the students will be able to**						BT Mapping (Highest Level)		
	CO1	Understand the concept of Eigen values and Eigen vectors, Diagonalization of a Matrix					**K3**		
	CO2	Solve higher order differential equations					**K3**		
	CO3	Understand the different types of partial differential equations					**K3**		
	CO4	Know about the Applications of double and triple integrals					**K3**		
	CO5	Gain the knowledge about Vector Calculus and its Applications					**K3**		
UNIT – I	**Matrices**					**Periods:12**			
Rank of a Matrix – Systems of Linear Equations – Characteristic equation – Cayley Hamilton Theorem – Eigen values and Eigen vectors of a real Matrix – Diagonalization of Matrices.									**CO1**
UNIT – II	**Differential Equations (Higher Order)**					**Periods:12**			
Linear Differential equations of higher order with constant coefficients – Euler's linear equation of higher order with variable coefficients – Method of Variation of parameters.									**CO2**
UNIT – III	**Functions of Several Variables**					**Periods:12**			
Partial derivatives – Total derivatives – Maxima and Minima of two variables – Lagrange's Method of multipliers.									**CO3**
UNIT – IV	**Multiple Integrals**					**Periods:12**			
Multiple Integrals – Change of order of integration (Cartesian form). Applications: Area as a double integral (Cartesian form) – Volume as a triple integral (Cartesian form).									**CO4**
UNIT – V	**Vector Calculus**					**Periods:12**			
Gradient – Divergence and Curl – Directional derivatives – Irrotational and Solenoidal vector fields – Properties (Statement only) – Gauss Divergence Theorem and Stoke's Theorem (without proofs).									**CO5**
Lecture Periods: 45	**Tutorial Periods: 15**		**Practical Periods: -**			**Total Periods: 60**			

Text Books

1. M.K. Venkataraman, "Engineering Mathematics", The National Publishing Company, 2nd Edition Chennai, 2016.
2. N. P Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Lakshmi Publications, New Delhi, 9th Edition, 2018.
3. S.Narayanan and T.K. Manickavasagam Pillay," Differential Equations and Its Applications", Viswanathan. S, Printers & Publishers Pvt Ltd, 2009.

Reference Books

1. G. Balaji, "Matrices and Calculus (Engineering Mathematics – I)" Balaji Publications, 9th Edition June 2023
2. A. Singaravelu, "Engineering Mathematics – I", Meenakshi publications, 1998.
3. Erwin Kreyszig, "Advanced Engineering Mathematics ", Wiley, 10th Edition, 2019.
4. B.V. Ramana," Higher Engineering Mathematics", Tata McGraw – Hill, New Delhi, 6th Edition, 2018.
5. C W. Evans, "Engineering Mathematics", A Programmed Approach, 3rd Edition, 2019.

Web References

1. http://www.yorku.ca/yaoguo/math1025/slides/chapter/kuttler-linearalgebra –slides- systems of equation-handout.pdf
2. http://www.math.cum.edu/~wn0g/2ch6a.pdf
3. https://nptel.ac.in/courses/122/104/122104017/
4. https://nptel.ac.in/courses/111/106/111106051/
5. https://nptel.ac.in/courses/111/108/111108081/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	-	2	1	1	-	-	-	-	1	3	-	-
2	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
3	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
4	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
5	2	2	1	-	-	-	1	-	-	-	-	1	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Physics / Chemistry**	Programme: **B.Tech.**						
Semester	**I**	Course Category Code: **BS**			End Semester Exam Type: **TE**			
Course Code	**U23BSTC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Physical Science for Engineers**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
(Common to all Branches)								
Prerequisite	Physics of 12th standard or equivalent / Chemistry of 12th standard or equivalent.							

Course Outcomes			BT Mapping (Highest Level)
	On completion of the course, the students will be able to		
	CO1	Understand the basic of properties of magnetic, dielectric and superconductors.	**K2**
	CO2	Identify the wave nature of the particles, physical significance of wave functions	**K3**
	CO3	Understand the basic principles of laser and fiber optics communication	**K2**
	CO4	Understand and familiar with the water treatment.	**K2**
	CO5	Understand the electrode potential for its feasibility in electrochemical reaction and uses of various batteries.	**K2**
	CO6	Understand the specific operating condition under which corrosion occurs a suggest a method to control corrosion.	**K2**

SECTION A - PHYSICS

UNIT-I	**Magnetic, Dielectric and Superconducting Materials**	**Periods: 8**	
Introduction to magnetic materials, Ferromagnetism- Domain theory-Types of energy-Hysteresis-Hard and Soft magnetic materials-ferrites-Dielectric materials-Types of polarization – Langevin-Debye equation-Frequency effects on polarization-Dielectric breakdown- Ferroelectric materials-Superconducting materials and their properties.			**CO1**
UNIT-II	**Quantum Mechanics**	**Periods: 7**	
Matter Waves - de Broglie Wavelength - Uncertainty Principle –Physical Significance of wave functions - Schrodinger wave Equation - Time Dependent - Time Independent - Application to Particle in a One Dimensional Box - Tunnel Diode.			**CO2**
UNIT-III	**Laser and Fiber Optics**	**Periods: 7**	
Lasers - Principles of Laser - Spontaneous and Stimulated Emissions - Einstein's Coefficients - Population Inversion and Laser Action –components of laser - Types of Lasers - NdYAG, CO_2 laser, GaAs Laser Fiber Optics - Principle and Propagation of light in optical fiber - Numerical aperture and acceptance angle - Types of optical fibers (material, refractive index, mode)			**CO3**

SECTION B – CHEMISTRY

UNIT-IV	**Water and Its Treatment**	**Periods: 8**	
Water: Sources and impurities, Water quality parameters: Definition and significance of-color, odour, turbidity,pH, hardness, alkalinity, TDS, COD and BOD. Desalination of brackish water: Reverse osmosis-disadvantagesof using hard water in boiler - Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning) and External treatment–Ion exchange demineralization and zeolite process.			**CO4**
UNIT-V	**Electrochemical Cells and Storage Devices**	**Periods: 8**	
Galvanic cells, single electrode potential, standard electrode potential, electrochemical series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes-hydrogen, calomel and Ag/AgCl. Batteries and fuel cells: Types of batteries- alkaline battery-lead storage battery-nickel-cadmium battery- fuel cell H_2 -O_2 fuel cell-applications.			**CO5**
UNIT-VI	**Corrosion**	**Periods: 7**	
Corrosion –Introduction - factors – types – chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control – material selection and design aspects – electrochemical protection – sacrificial anode method and impressed current cathodic method. Uses of inhibitors, metallic coating – anodic coating, cathodic coating. Metal cladding, Electroplating of Copper and electroless plating of nickel.			**CO6**

Lecture Periods: 45	**Tutorial Periods:-**	**Practical Periods:-**	**Total Periods: 45**

Text Books

1. V Rajendran, "Engineering Physics", 2nd Edition, TMH, New Delhi 2011.
2. S.S Dara – "A text book of Engineering Chemistry" - 15th Edition, 2021. S.Chand Publications.
3. C.Jain, Monica Jain, "Engineering Chemistryll" 17th Ed. Dhanpat Rai Pub. Co., New Delhi, (2015).

Reference Books

1. R.Murugeshan, "Modern Physics", S. Chand &Co, New Delhi 2006.
2. William D Callister Jr., "Material Science and Engineering", 6th Edition, John Wiley and sons, 2009.
3. Jain & Jain "Engineering chemistry", 23rd Edition, DhanpatRai Publishing Company. 2022
4. Mars Fontana "Corrosion Engineering", July 2017
5. JinaRedlin, "Handbook of Electrochemistry", March 28, 2005

Web References

1. https://www.sciencedaily.com/terms/materials_science.htm.
2. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/materials science.html.
3. https://study.com/academy/lesson/semiconductors-superconductors-definition-properties.html
4. https://mechanicalc.com/reference/engineering-materials

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	-	-	-	-	-	-	-
2	3	2	3	2	-	-	-	-	-	-	-	-	-	-	-
3	3	2	3	2	-	-	-	-	-	-	-	-	-	-	-
4	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
5	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
6	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil / Mechanical**	Programme : **B.Tech.**						
Semester	**I**	Course Category Code: **ES**			End Semester Exam Type: **TE**			
Course Code	**U23ESTC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Basics of Civil and Mechanical Engineering**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to EEE, ECE, ICE, MECH, Civil, Mechatronics Branches)

Prerequisite: Basic Science

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Understand the types of buildings and materials.	**K2**
	CO2	Summarize on the various components of buildings and surveying concepts	**K2**
	CO3	Identify the various infrastructure facilities	**K2**
	CO4	To familiarize the working principles of IC engines and automobile systems	**K2**
	CO5	To understand about the power generation systems and its components	**K1**
	CO6	To acquire knowledge about the various machining process.	**K2**

SECTION A - CIVIL ENGINEERING

UNIT - I	**Buildings and Buildings Materials**	**Periods: 08**
Buildings – Definition – Classification according to NBC-plinth area, Floor area, carpet area, floor space index - Development of Smart cities - Green building, Benefits from green building. Building Materials - stone, brick, cement, cement mortar, concrete, steel, Timber - their properties and uses.		**CO1**
UNIT - II	**Buildings Components and Surveying**	**Periods: 08**
Various Buildings Components and their functions. Foundation: function and types - Brick masonry, Stone Masonry and its types – Floors, Roofs and its types. Surveying: Objects – Classification – Principles – Measurements of Distances and areas – Leveling.		**CO2**
UNIT - III	**Basic Infrastructure**	**Periods: 07**
Roads and Bridges – types, components advantage and disadvantages. Railways - Permanent way and its elements. Sources of Water - Quality of Water- Domestic sewage Treatment – Rain Water harvesting – Dams - site selection for dam construction, types of dams.		**CO3**

SECTION B – MECHANICAL ENGINEERING

UNIT- IV	**Internal and External Combustion Systems**	**Periods: 08**
IC engines – Classification – Working principles – Diesel and Petrol Engines: Two stroke and four stroke engines – merits and demerits. Steam generators (Boilers) – Classification – Constructional features (of only low-pressure boilers) – Boiler mountings and accessories – Merits and demerits – Applications.		**CO4**
UNIT- V	**Power Generation Systems, Refrigeration and Air Conditioning System**	**Periods: 07**
Power plants: Thermal – Nuclear, Hydraulic, Solar, Wind, Geothermal, Wave, Tidal and Ocean Thermal Energy Conversion systems - Functions, Applications - Schemes and layouts (Description only) Refrigeration and Air Conditioning System: Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.		**CO5**
UNIT- VI	**Manufacturing Process**	**Periods: 07**
Lathe - types, Specifications, Operations of a centre lathe. Casting - Pattern making, Allowances, Green sand and dry sand moulding, casting defects. Welding - Arc and Gas welding process, brazing and soldering (process description only).		**CO6**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books
1. Dr. S. Jayakumar, “Basic Civil Engineering”, Aagash Nekaa Publications, 2011
2. G Shanmugam, MS Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education, 1st Edition, 2018.
3. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.
Reference Books
1. M.P. Poonia, S.C. Sharma and T.R. Banga, Basic Mechanical Engineering, Khanna Publishing House 2018.
2. S.S.Bhavikatti, Basic Civil engineering, New Age International Ltd. 2018.
3. V. Rameshbabu, Basic Civil & Mechanical Engineering, VRB Publishers Private Limited, January 2017.
4. Serope Kalpakjian, Steven Schmid, Manufacturing Engineering and Technology, 7th Edition, Pearson Publication, 2014.
5. Gopi Satheesh, Basic Civil engineering, Pearson Publications, 3rd Edition, 2015.
Web References
1. https://nptel.ac.in/courses/112107291/
2. https://nptel.ac.in/courses/112/103/112103262/
3. https://ocw.mit.edu/courses/mechanical-engineering/2-61-internal-combustion-engines-spring-2017/ lecture-notes/
4. https://nptel.ac.in/courses/105102088/
5. https://nptel.ac.in/courses/105104101/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	-	1	-	-	-	-	-	-	1	-	-	-
2	3	1	1	-	1	-	-	-	-	-	-	1	-	-	-
3	3	1	1	-	1	-	-	-	-	-	-	1	-	-	-
4	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-
5	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Mechanical Engineering**	Programme : **B.Tech.**						
Semester	**I**	Course Category Code: **ES**			End Semester Exam Type: **TE**			
Course Code	**U23ESTC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Mechanics**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to EEE, ECE, MECH, CIVIL, Mechatronics Branches)

Prerequisite: Engineering Physics

Course Outcomes		**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1	Recognize the basics of equilibrium of particles in 2D and 3D	**K2**
	CO2	Review the requirements of equilibrium of rigid bodies in 2D and 3D.	**K2**
	CO3	Solve problem related to friction force.	**K3**
	CO4	Compute the center of mass and moment of inertia of surfaces and solids.	**K3**
	CO5	Predict displacement, velocity and acceleration of dynamic particles.	**K3**

UNIT- I	**Basics and Statics Of Particles**	**Periods: 09**
Introduction - Units and Dimensions - Vectorial representation of forces and moments – Coplanar Forces - Lami's theorem, Parallelogram and triangular Law of forces -Resolution of forces - Equilibrium of a particle - Principle of transmissibility - Equivalent system of force - Free body diagram		**CO 1**
UNIT- II	**Equilibrium of Rigid Bodies**	**Periods: 09**
Types of supports and their reactions -requirements of stable equilibrium - Moments and Couples -Moment of a force about a point and about an axis -Vectorial representation of moments and couples - Scalar components of a moment - Varignon's theorem -Equilibrium of Rigid bodies in two dimensions – Forces in space -Equilibrium of a particle in space - Equivalent systems of forces - Equilibrium of Rigid bodies in three dimensions (Descriptive only).		**CO 2**
UNIT - III	**Structural Analysis of Trusses and Friction**	**Periods: 09**
Trusses - Definition of a truss - Simple Trusses - Analysis of Trusses - Method of joints - Method of sections - Friction force - Laws of sliding friction - equilibrium analysis of simple systems with sliding friction -wedge friction- Rolling resistance.		**CO 3**
UNIT - IV	**Properties of Surfaces and Solids**	**Periods: 09**
Determination of centroid of areas, volumes and mass - Pappus and Guldinus theorems - moment of inertia of plane and areas- Parallel axis theorem and perpendicular axis theorem, radius of gyration of area- product of inertia- mass moment of inertia.		**CO 4**
UNIT - V	**Dynamics of Particles**	**Periods: 09**
Displacements, Velocity and acceleration, their relationship - Relative motion - Curvilinear motion - Newton's law - Work Energy Equation of particles -Impulse and Momentum -Impact of elastic bodies.		**CO 5**

Lecture Periods: 30	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Beer, and Johnston Jr. E.R. "Vector Mechanics for Engineers", McGraw-Hill Education India Pvt Ltd., 11th Edition, 2016.
2. J.L. Meriam & L.G. Karidge, Engineering Volume I and Engineering Mechanics: Dynamics, 8th edition, Wiley student edition, 2016.
3. R.C, Hibbeller, "Engineering Mechanics", Prentice hall, 14th edition, 2016.

Reference Books

1. Arthur P. Boresi and Richard J. Schmidt, "Engineering Mechanics: Statics and Dynamics", Thomson Asia
2. Private Limited, Singapore, 2010.
3. D.P.Sharma "Engineering Mechanics", Dorling Kindersley India Pvt. Ltd, New Delhi, 2010
4. S.Rajasekaran, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt., Ltd., 2012.
5. S.S.Bhavikatti and K.G. Rajashekarappa, Engineering Mechanics, New Age International(P) Ltd, New Delhi, 7th

Edition, 2019.

Web References	
1.	http://nptel.iitm.ac.in/video.php?subjectId=112103108
2.	http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/Engineeringmechanics/Table of Contents.html
3.	https://nptel.ac.in/courses/112/106/112106286/
4.	https://www.coursera.org/learn/engineering-mechanics-statics
5.	https://nptel.ac.in/courses/122/104/122104014/

COs/POs/PSOs Mapping

COs	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
1	3	2	2	3	-	-	-	-	-	-	-	1	2	-	2
2	3	2	2	3	-	-	-	-	-	-	-	1	2	-	2
3	3	2	2	3	-	-	-	-	-	-	-	1	2	-	2
4	3	2	2	3	-	-	-	-	-	-	-	1	2	-	2
5	3	2	2	3	-	-	-	-	-	-	-	1	2	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**					**End Semester Examination (ESE) Marks**	**Total Marks**
	CAT 1	**CAT 2**	**Model Exam**	**Assignment***	**Attendance**		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**EEE and ECE**	Programme: **B.Tech.**						
Semester	**I**	Course Category : **ES**			End Semester Exam Type: **TE**			
Course Code	**U23ESTC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Basics of Electrical and Electronics Engineering**	**3**	**-**	**-**	**3**	**25**	**75**	**100**

(Common to CSE, IT, MECH, CIVIL, MCTR, CCE, AI&DS, FT and CSBS Branches)

Prerequisite	**Mathematics and Physics**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Apply the basic concepts and various laws in DC circuits.	**K3**
	CO2 Analyze the AC circuits and develop resonance conditions for transmitter and receiver circuits.	**K3**
	CO3 Gain the knowledge of power system components, importance of electrical safety measures and real time applications of transformer and motor.	**K2**
	CO4 Understand the operator of semiconductor diode and its applications.	**K2**
	CO5 Explain the characteristics and operation of BJT and FET.	**K2**
	CO6 Relate and Explain Different Communication Systems.	**K2**

Section A – Electrical Engineering

UNIT - I	**DC Circuits**	**Periods: 8**
Concept of Potential Difference, Current, Resistance, Inductance and Capacitance, Work, Power, Energy, Current and Voltage sources - ideal and practical sources - concept of dependent and independent sources, Ohm's law, Kirchhoff's law, Series parallel combination of R, L, C components, Voltage Divider and Current Divider Rules, Mesh and Nodal analysis, Star/Delta transformation, Network Theorems - Superposition, Thevenin, Norton and Maximum Power Transfer.		**CO1**
UNIT - II	**AC Circuits**	**Periods: 8**
AC waveform definitions - form factor, peak factor, R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, Resonance in series and parallel circuits, band-width and quality factor, Three Phase balanced AC Circuits (Y-Δ and Y-Y) - Power Measurement – Two Wattmeter method.		**CO2**
UNIT - III	**Electrical Safety and Electrical Machines**	**Periods: 7**
Layout of electrical power system and its functions, Wiring Accessories, Types of domestic wiring, Necessity of earthing, insulators and cables, Safety devices - fuse, relay and circuit breaker - Sensors and its types. Faraday's Law of electromagnetic induction, Fleming's Right and Left hand rule - DC Generator and DC Motor - construction, principle, load test and performance characteristics - Auto transformer, Single phase transformer- construction, principle, load test - Single phase capacitor start and run induction motor – Load test.		**CO3**

Section B – Electronics Engineering

UNIT - IV	**Semiconductor Diodes And Applications**	**Periods: 7**
Introduction semiconductor materials – Doping - Intrinsic and Extrinsic Semiconductor – PN junction diode, structure, characteristics - diffusion and depletion capacitance - Rectifier, Half wave and Full wave rectifier - zener diode characteristics - zener diode as regulator – Light Emitting Diode (LED) - Solar Cell.		**CO4**
UNIT - V	**Transistors**	**Periods: 7**
Bipolar Junction Transistor - construction – operation - Common Base, Common Emitter, Common collector Configuration –characteristics – Biasing - numerical application. Junction Field Effect Transistor (JFET), Metal oxide semiconductor Field Effect Transistor, EMOSFET-DMOSFET operation characteristics - Numerical application.		**CO5**
UNIT - VI	**Communication Systems**	**Periods: 8**
Need for Modulation – Block diagram of analog communication System - AM, FM, PM Definitions and Waveforms – Comparison of digital and analog communication system- Block diagram of digital communication system – Electromagnetic Spectrum. Wired and wireless Channel – Block diagram of communication systems – satellite communication – Cellular Mobile Communication – Fibre Optical Communication System.		**CO6**

Lecture Periods: 45	**Tutorial Periods:-**	**Practical Periods:-**	**Total Periods: 45**

Text Books

1. R. K. Rajput, "Basic Electrical and Electronics Engineering", University Science Press, 2nd Edition, 2017.
2. Dr. R. Saravanakumar, Dr.V. Jegathesan, Dr. K. Vinoth Kumar, Dr. K. Kowsalya, "Basic Electrical and Electronics Engineering", Wiley Publisher, 2nd Edition, 2022.
3. R. Muthusubramaniam, S. Salivahanan and K. A. Mureleedharan, "Basic Electrical Electronics and Computer Engineering", Tata McGraw Hill, 2018.

Reference Books

1. A. Sudhakar and S. P. Shyam Mohan, "Circuits and Networks: Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd., New Delhi, 4th Edition, 2017.
2. D. P. Kothari and I. J. Nagrath, "Electric Machines", Tata McGraw Hill, New Delhi, 5th Edition, 2017.
3. B. L. Theraja, A. K. Theraja, "A Textbook of Electrical Technology – Volume - II", S Chand & Co. Ltd., New Delhi, 23rd Edition, 2009.
4. David. A. Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, India, 4th Edition, 2020
5. Wayne Tomasi, "Electronic Communication Systems- Fundamentals Theory Advanced", Pearson Education, 6th Edition, 2018.

Web References

1. https://nptel.ac.in/courses/108/108/108108076/
2. https://www.electrical4u.com/
3. https://nptel.ac.in/courses/108/102/108102146/
4. https://onlinecourses.nptel.ac.in/noc21_ee55/
5. https://nptel.ac.in/courses/117/102/117102059

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	2	-	-	-	-	-	-	1	3	2	-
2	3	3	3	-	2	-	-	-	-	-	-	1	3	2	-
3	3	3	3	-	2	-	-	-	-	-	-	1	3	2	-
4	3	3	3	-	2	-	-	-	-	-	-	1	3	2	-
5	3	3	3	-	2	-	-	-	-	-	-	1	3	2	-
6	3	3	3	-	2	-	-	-	-	-	-	1	3	2	-

Correlation Level: 1 – Low, 2 – Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**English**			Programme: **B.Tech.**				
Semester	**I**			Course Category : HS			End Semester Exam Type:**TE**	
Course Code	**U23ENBC01**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM / ESE / TM
Course Name	**Communicative English - I**			**2**	**-**	**2**	**3**	**50 / 50 / 100**

(Common to ALL Branches except CSBS)

Prerequisite	Basics of English Language		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the communication flow in organization and its objectives	**K2**
	CO2	Write the technical contents with grammatically precise sentences	**K2**
	CO3	Articulate with correct pronunciation and overcome vernacular impact in speaking	**K3**
	CO4	Express opinions confidently in formal and informal communicative contexts	**K2**
	CO5	Attend interview with assertiveness	**K3**

UNIT- I	**Workstead Communication**	**Periods:10**	
Communication, Definition, Process, Channels, Barriers, Strategies for Effective Communication, Verbal and Nonverbal Communication - Listening, Types, Barriers, Enhancing Listening Skills - Bibliography: Book, Journal and Internet References			**CO1**
UNIT- II	**Common Errors In Writing And Comprehension Strategies**	**Periods:10**	
Subject Verb Agreement, Misplaced Modifiers, Squinting Modifiers, Dangling Modifier, Fused Sentence, Comma Splice, Sentence Fragment - Reading Comprehension: Technical passage, Strategies: Skimming, Scanning, Intensive and Extensive Reading, Prediction, and Contextual Meaning			**CO2**
UNIT- III	**Phonetics**	**Periods:10**	
Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Non-silent Letters, Intonation, Spelling Rules and Words often misspelled, Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue			**CO3**
UNIT- IV	**Communication Practice-I**	**Periods:15**	
List of Exercises **Listening**: Self Introduction videos **Speaking**: Self-Introduction, Extempore, and Role Play **Reading**: Non-Technical Comprehension Passage **Writing:** Common Errors in Writing			**CO4**
UNIT-V	**Interpersonal Communication-I**	**Periods:15**	
List of Exercises **Listening:** Speech Sounds, Interview Videos **Speaking**: Debate, Structured Group Discussion, and Conversation **Reading**: Commonly Confused Words **Writing:** Transcription			**CO5**

Lecture Periods:30	**Tutorial Periods:-**	**Practical Periods:30**	**Total Periods:60**

Text Books

1. Richa Mishra , RatnaRao, “A textbook of English Language Communication Skills”, Macmillan Publishers India Private Ltd., Revised Edition 2021.
2. Rizvi M. Ashraf, “Effective Technical Communication”, New Delhi: Tata-McGraw-Hill Publishing Company Limited, 4th Edition, 2010.
3. Balasubramanian T, “English Phonetics for Indian students workbook”, 2nd Edition, Trinity Press, 2016.

Reference Books

1. N.P.Sudharshana, C. Savitha,” English for Engineers”, Cambridge University Press, 2018.
2. Raman, Meenakshi, and Sharma, Sangeetha, “Technical Communication - Principles and Practice”, 3rd Edition, Oxford University Press, 2017.
3. Comfort, Jeremy,etal., “Speaking Effectively: Developing Speaking Skills for Business English”, Cambridge University Press, Cambridge, Reprint 2011.
4. Wren & Martin, “High School English Grammar and Composition”, S Chandh &Co. Ltd, 2015.
5. Boove, Courtland L, “Business Communication Today”, Pearson Education, New Delhi,2002.

Web References

1. https://lemongrad.com/subject-verb-agreement-rules/
2. https://opentextbc.ca/advancedenglish/chapter/misplaced-and-dangling-modifiers/
3. https://www.hitbullseye.com/Reading-Comprehension-Tricks.php
4. https://www.softwaretestinghelp.com/how-to-crack-the-gd/
5. https://worldscholarshipvault.com/neutralize-mother-tongue-interference/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
2	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
4	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
5	1	-	-	-	-	-	-	-	1	3	-	1	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Theory						
Assessment	Continuous Assessment Marks (CAM)				End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Attendance		
Marks	5	5	5	5	75	60
	20(to be weighted for 10 marks)				(to be weighted for 50 marks)	

Practical				
Continuous Assessment Internal Evaluation		End Semester Internal Evaluation		Total Marks
30(to be weighted for 10 marks)		30 marks		40
Listening (L)*	10	Listening (L)*	10	
Speaking(S)	5	Speaking(S)	5	
Reading(R)*	10	Reading(R)*	10	
Writing(W)*	5	Writing(W)*	5	

- **LRW components of Practical can be evaluated through Language Lab Software**

Department	**EEE and ECE**	Programme: **B.Tech.**						
Semester	**I**	Course Category : **ES**			End Semester Exam Type: **LE**			
Course Code	**U23ESPC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Basics of Electrical and Electronics Engineering Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
(Common to CSE, IT, MECH, CIVIL, MCTR, CCE, AI&DS, FT, CSBS Branches)								
Prerequisite	Mathematics and Physics							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Build the different wiring for domestic and commercial applications.	**K3**
	CO2 Design and analyze the domestic power distribution.	**K3**
	CO3 Estimate the performance of transformer and motors by conducting load test.	**K3**
	CO4 Describe characteristics of semiconductor diode and utilize it for different applications	**K5**
	CO5 Relate the characteristics of various transistor	**K2**
	CO6 Understand Rectifiers and Regulators	**K2**

List of Experiments

Section– A Electrical Experiments

Demonstration on Power Sources, Ammeter, Voltmeter, Wattmeter and Energy meter are Pre-requisite for conducting this Electrical Engineering Lab.

1. Electrical safety precautions and study of tools, accessories, electrical joints and electrical symbols.
2. Domestic Wiring Practice
   - Staircase wiring
   - Doctor's room wiring
   - Godown wiring
   - Wiring of Ceiling fan, LED lamps and Iron Box.
3. Design of Domestic power distribution.
4. Measurement of 3-phase power using two wattmeter method
5. Load test on DC shunt motor.
6. Load test on single phase transformer.
7. Load test on single phase Induction Motor.

Section – B Electronics Experiments

1. Study of Electronic components and equipment: Resistor, Capacitor
2. Measurement of AC signal parameter (Peak-Peak, rms period, frequency) using CRO.
3. VI Characteristics of PN junction diode, Zener diode
4. Input and output characteristics of Common Emitter configuration of BJT
5. Characteristics of JFET
6. Measurement of Ripple factor of HWR, FWR
7. Voltage Regulator using Zener Diode

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Web References

1. http://eie.sliet.ac.in/laboratories/basic-electrical-engineering-lab/
2. https://www.electronics-tutorials.ws/accircuits/series-circuit.html
3. https://www.allaboutcircuits.com/textbook/experiments/
4. https://www.electronicshub.org/measurements-of-ac-current/
5. http://www.electronics-tutorials.ws

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	-	-	1	-	-	3	-	-	1	3	2	-
2	3	2	3	-	-	1	-	-	3	-	-	1	3	2	-
3	3	2	3	-	-	1	-	-	3	-	-	1	3	2	-
4	3	2	3	-	-	1	-	-	3	-	-	1	3	2	-
5	3	2	3	-	-	1	-	-	3	-	-	1	3	2	-
6	3	2	3	-	-	1	-	-	3	-	-	1	3	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in Practical classes			Model Practical Examination	Attendance		
	Conduction of Practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Mechanical Engineering**	Programme : **B.Tech.**						
Semester	**I**	Course Category Code: **ES**			End Semester Exam Type: **LE**			
Course Code	**U23ESPC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Design thinking and IDEA Lab**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
(Common to ALL Branches)								
Prerequisite	Basic Knowledge of Science							

Course Outcomes		**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1	Demonstrate a comprehensive understanding of the tools and inventory associated with the IDEA Lab.	**K2**
	CO2	Develop proficiency in ideation techniques to generate creative and innovative solutions for various design challenges and problems	**K3**
	CO3	Acquire practical knowledge of mechanical and electronic fabrication processes, including hands-on experience with machinery, tools, and techniques used in the manufacturing and assembly of physical components.	**K3**
	CO4	Cultivate the skills necessary for developing innovative and desirable products, including the ability to integrate user needs, market trends, and technological advancements into the design process.	**K4**
	CO5	Apply iterative design methodologies to refine and improve solutions based on feedback, user testing, and evaluation of functional, aesthetic, and usability aspects	**K4**

Design process: Traditional design, Design thinking, Existing sample design projects, Study on designs around us, Compositions/structure of a design, Innovative design: Breaking of patterns, Reframe existing design problems, Principles of creativity Empathy: Customer Needs, Insight-leaving from the lives of others/standing on the shoes of others, Observation

Design team-Team formation, Conceptualization: Visual thinking, Drawing/sketching, New concept thinking, Patents and Intellectual Property, Concept Generation Methodologies, Concept Selection, Concept Testing, Opportunity identification Prototyping: Principles of prototyping, Prototyping technologies, Prototype using simple things, Wooden model, Clay model, 3D printing; Experimenting/testing.

Sustainable product design, Ergonomics, Semantics, Entrepreneurship/business ideas, Product Data Specification, Establishing target specifications, Setting the final specifications. Design projects for teams.

List of Lab Activities and Experiments

1. Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
2. Machining of 3D geometry on soft material such as softwood or modelling wax.
3. 3D scanning of computer mouse geometry surface. 3D printing of scanned geometry using FDM or SLA printer.
4. 2D profile cutting of press fit box/casing in acrylic (3 or 6 mm thickness)/cardboard, MDF (2 mm) board using laser cutter & engraver.
5. 2D profile cutting on plywood /MDF (6-12 mm) for press fit designs.
6. Familiarity and use of welding equipment.
7. Familiarity and use of normal and wood lathe.
8. Embedded programming using Arduino and/or Raspberry Pi.
9. Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.
10. Discussion and implementation of a mini project.
11. Documentation of the mini project (Report and video).

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Text Books

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd
2. Workshop / Manufacturing Practices (with Lab Manual), Khanna Book Publishing.

Reference Books

1. Ulrich and Eppinger, Product Design and Development, 3rd Edition, McGraw Hill, 2004
2. The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018.
3. The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product. Sean Michael Ragan, Weldon Owen; 2017.
4. The Art of Electronics. 3rd edition. Paul Horowitz and Winfield Hill. Cambridge University Press.
5. Practical Electronics for Inventors. 4th edition. Paul Sherz and Simon Monk. McGraw Hill.
6. Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards. Simon Monk and Duncan Amos. McGraw Hill Education.
7. Programming Arduino: Getting Started with Sketches. 2nd edition. Simon Monk. McGraw Hill.
8. Venuvinod, PK., MA. W., Rapid Prototyping – Laser Based and Other Technologies, Kluwer
9. Chapman W.A.J, "Workshop Technology", Volume I, II, III, CBS Publishers and Distributors, 5th Edition,2002.

Web References

1. https://onlinecourses.nptel.ac.in/noc23_mg72

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	2	-	-	2	-	3	2	-	-	-
2	3	3	3	2	2	2	-	-	2	-	3	2	-	-	-
3	3	3	3	2	3	2	-	-	2	-	3	2	-	-	-
4	3	3	3	2	3	2	-	-	2	-	3	2	-	-	-
5	3	3	3	2	3	2	-	-	2	-	3	2	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**I**	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23CEP101**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Civil Engineering Practice Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

Prerequisite	Basics of Civil and Mechanical Engineering		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Make a carpentry joint in the given wooden pieces	K4
	CO2	Prepare a welding joint in the given material	K4
	CO3	Make a fitting work in the given material	K4
	CO4	Prepare a different types of bonds in the brick	K4
	CO5	Prepare a basic connections involved in plumbing	K4

List of Experiments:

Carpentry Work

1. Lap joint
2. Butt joint
3. T Joint

Welding Work

4. Lap joint
5. Butt joint
6. T Joint

Fitting Work

7. V fitting
8. T fitting
9. Different types of brick bonds using the concept of line, plumb bob, right angle and water level
10. Different types of pipe joints using plumbing accessories
11. Study on tools used in carpentry, welding and fitting works
12. Setting out of foundation for Single Room Building

Lecture Periods: 0	**Tutorial Periods:** 0	**Practical Periods:** 3 0	**Total Periods:** 30

Reference Books

1. David H. Phillips 'Welding Engineering - An Introduction', second edition, Wiley; 2nd edition (February 21, 2023)
2. DK, 'Woodworking - The Complete Step-by-Step Manual', April 7, 2020
3. George Lister Sutcliffe, 'Sanitary Fittings and Plumbing (Classic Reprint)', Forgotten Books (23 April 2018)
4. K. C. JOHN, 'Mechanical workshop practice's. PHI Learning Pvt. Ltd., 27-Aug-2010

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1. https://archive.nptel.ac.in/courses/112/103/112103263/
2. https://archive.nptel.ac.in/courses/124/105/124105013/
3. https://archive.nptel.ac.in/courses/105/106/105106197/
4. https://web.uettaxila.edu.pk/CMS/AUT2013/ieWPbs/notes/Workshop%20Practice%20(Fitting%20Shop).pdf
5. https://www.govinfo.gov/content/pkg/GOVPUB-C13-f181dc241045a63f3355422ecf6a04eb/pdf/GOVPUB-C13-f181dc241045a63f3355422ecf6a04eb.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	1	2	1	1	1		1	1		2	3	1	2
2	3	1	1	1	1	1		1	1		2	3	1	1
3	3	1	1	1	1	1		2	1		2	3	1	1
4	3	1	1	1	1	1		2	2		2	3	1	1
5	3	1	1	1	1	1		2	2		2	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**I**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23CEC1XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Certification Course - I**	**0**	**0**	**4**	**-**	**100**	**-**	**100**
CIVIL								
Prerequisite	**-**							

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as “pass” on satisfactory completion. A letter grade “P” is awarded to declare pass.

(iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**		**Total Marks**
	Attendance	**MCQ Test**	
Marks	**10**	**90**	**100**

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**I**	Course Category : **MC**			End Semester Exam Type: -			
Course Code	**U23CEM101**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Induction Programme**	-	-	-	Non-Credit	-	-	-
Prerequisite	**-**							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Develop holistic attitude and harmony in the individual, family, and Society	**K2**
	CO2 Acquire grammar skills and capable to write and speak English confidently	**K2**
	CO3 Understand the basic concepts in Mathematics and Programming	**K2**
	CO4 Know about the art and culture, language and literature of this vast secular nation	**K2**
	CO5 Identify the inherent talent and develop it professionally	**K3**

UNIT-I	**Universal Human Values**	**Periods: 12**
Welcome and Introductions - Getting to know each other, Aspirations and Concerns - Individual Academic and Career, Expectations of Family, Peers, Society, Nation, Fixing one's Goals, Self-Management - Self-confidence, Peer Pressure, Time Management, Anger, Stress Personality Development, Self-improvement, Health - Health issues, Healthy diet, Healthy lifestyle, Hostel life, Relationships - Home sickness, Gratitude towards Parents, Teachers and others Ragging and interaction, Competition and Cooperation, Peer Pressure, Society - Participation in Society, Natural Environment - Participation in Nature, Sum Up - Role of Education, Need for a Holistic Perspective, Self-evaluation and Closure - Sharing and feedback.		**CO1**

UNIT-II	**Proficiency in English**	**Periods: 12**
Communication skills - Prognostic test on Grammar - Synonyms, Antonyms, Tenses, Sentence Completion, Idioms and Phrases, One-word Substitution, Homophones, Homonyms, Use of Prepositions, Subject-verb Agreement - Writing - Paragraph writing, Letter writing, Essay writing, Story Development.		**CO2**

UNIT-III	**Bridge Course in Mathematics and C Programming**	**Periods: 12**
Mathematics: Fundamentals of differential and integral calculus: Theory and Practice, Limit of function - Fundamental results on limits - Continuity of a function - Concept of differentiation - Concept of derivative - Slope of a curve -Differentiation Techniques - Derivatives of elementary functions from first principle - Derivatives of inverse functions - Logarithmic differentiation - Method of substitution - Differentiation of parametric functions -Differentiation of implicit functions - Higher order derivatives. Integrals of functions containing linear functions -Method of integration (Decomposition method, method of substitution, integration by parts) - Definite integrals. Simple definite integrals - Properties of Definite integrals - Reduction formulae - Area and volume - Length of curve - surface area of a solid. **C Programming:** Features of C and its basic Structure - Keywords - constants - variables - operators - Data types - Formatted input and output statements - Control and Looping statement - Arrays - Functions - Strings - writing simple C programs.		**CO3**

UNIT-IV	**Literary Activities**	**Periods: 12**
Team building activities - Quiz - Oral Exercises - Group discussion, Debate, Extempore, Role play, சிறப்பு சொற்பொழிவு - தமிழர் மரபு மற்றும் தமிழர் தொழில்நுட்பம்.		**CO4**

UNIT-V	**Creative Arts**	**Periods: 12**
Introduction to painting and renowned artworks - Documentary and Short films - Music - Vocal, Instrumental - Dance - Classical, Cinematic - Mimicry - Mime.		**CO5**

Lecture Periods: 60	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 60**

Reference Books

1. R.R Gaur, R. Asthana, G.P. Bagaria," A Foundation Course in Human Values and Professional Ethics", Excel Books, New Delhi, 2nd Revised Edition, 2019.
2. Kumar Mohan R, "English Grammar for all (Functional and Applied Grammar)", Unicare Academy, 2022.
3. Seely, John," Oxford A-Z of Grammar and Punctuation, Oxford Publication, 2013.
4. B.V. Ramana," Higher Engineering Mathematics", Tata McGraw – Hill, New Delhi, 6th Edition, 2018.
5. Dr. A. Singaravelu, "Engineering Mathematics - I", Meenakshi publications, Tamil Nadu, 2019.
6. E. Balagurusamy, "PROGRAMMING IN ANSI C", Mc Graw Hill, 8th Edition, 2019.
7. Dr.K.K.Pillay,"Social Life of Tamils", A joint publication of TNTB & ESC and RMRL
8. R.Balakrishnan, "Journey of Civilization",Roja muthiah research publishers, 1st Edition 2019
9. தமிழக வரலாறு - மக்களும் பண்பாடும், பிள்ளை, கே. கே. , சென்னை : உலகத் தமிழாராய்ச்சி நிறுவனம் , 2002.
10. கணினித்தமிழ் - முனைவர் இல.சுந்தரம், விகடன் பிரசுரம்.
11. கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம், தமிழக தொல்லியல் துறை

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1. http://www.newsociety.com/Books/S/Slow-isBeautiful
2. https://www.aplustopper.com/formal-letter/
3. https://www.javatpoint.com/c-programming-language-tutorial
4. http://www.math.cum.edu/~wn0g/2ch6a.pdf
5. https://education.nsw.gov.au/teaching-and-learning/curriculum/creative-arts

SEMESTER II

Department	**Mathematics**	Programme : **B.Tech.**						
Semester	**II**	Course Category Code : **BS**			End Semester Exam Type :**TE**			
Course Code	**U23MATC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Mathematics – II**	**3**	**1**	**-**	**4**	**25**	**75**	**100**
(Common to ALL Branches Except CSBS, FT)								
Prerequisite	Basic Mathematics							

Course Outcome		**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1	Convert a periodic function into series form.	**K2**
	CO2	Compute Fourier transforms of various functions.	**K3**
	CO3	Solve Differential Equations using Laplace transforms.	**K3**
	CO4	Apply inverse Laplace transform of simple functions.	**K3**
	CO5	Solve difference equations using Z – transforms.	**K3**

UNIT – I	**Fourier Series**	**Periods:12**	
Dirichlet's conditions – General Fourier series – Odd and Even functions – Half-Range sine series and cosine series – Change of intervals – Parseval's Identity.			**CO1**
UNIT – II	**Fourier Transforms**	**Periods:12**	
Fourier Transforms and its inverse – Properties of Fourier Transform (without proof) – Fourier sine and cosine Transforms and their properties (excluding proof).			**CO2**
UNIT – III	**Laplace Transforms**	**Periods:12**	
Laplace transforms of elementary functions and Periodic functions – Basic properties (excluding proof) – Laplace transforms of derivatives and integrals – Initial and final value theorems.			**CO3**
UNIT – IV	**Inverse Laplace Transforms**	**Periods:12**	
Definition of inverse Laplace Transforms – Convolution theorem (excluding proof) – Solutions of Linear Ordinary Differential Equations of second order with constant coefficients.			**CO4**
UNIT – V	**Z – Transforms**	**Periods:12**	
Z-transforms – Elementary Properties – Inverse Z-transforms (using partial fraction and Residues) – Solution of difference equations using Z - transform.			**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. T. Veerarajan, "Engineering Mathematics", Tata McGraw Hill, New Delhi, 3rd Edition, 2011.
2. C. P. Gupta, Shree Ram Singh. M. Kumar, "Engineering Mathematics for semester I & II", Tata McGraw Hill, New Delhi, 2nd Edition, 2016.
3. H.K. Dass, "Advanced Engineering Mathematics", S. Chand, New Delhi, 22nd Edition 2019.

Reference Books

1. N.P. Bali and Dr. Manish Goyal, "A TEXTBOOK OF ENGINEERING MATHEMATICS", UNIVERSITY SCIENCE PRESS, India, 8th Edition, 2016.
2. P. Siva Ramakrishna Das and C. Vijayakumari, "Engineering Mathematics", Pearson India Education services Pvt. Ltd, India 1st 2017.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition, 2019.
4. G. Balaji, "Engineering Mathematics - Transforms and Partial Differential Equations", G. Balaji Publishers, 18th Edition, 2022.
5. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2017.

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1. https://nptel.ac.in/courses/111105121/
2. https://nptel.ac.in/courses/111105035/
3. https://nptel.ac.in/courses/11110711

4. https://swayam.gov.in/nd1_noc20_ma17/preview
5. https://nptel.ac.in/courses/111/103/111103021/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	-	1	-	-	-	-	-	1	1	-	-
2	3	2	1	1	-	1	-	-	-	-	-	1	3	-	-
3	3	2	1	1	-	1	-	-	-	-	-	1	3	-	-
4	3	2	1	1	-	1	-	-	-	-	-	1	3	-	-
5	3	2	1	1	-	1	-	-	-	-	-	1	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**II**	Course Category Code: **ES**			End Semester Exam Type: **TE**			
Course Code	**U23CSTC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in C**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to All Branches)

Prerequisite	NIL		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Comprehend the basics of Computers.	**K2**
	CO2	Illustrate the concepts of control structures and looping.	**K2**
	CO3	Implement programs using arrays and functions.	**K3**
	CO4	Demonstrate programs using Structure and Pointers.	**K3**
	CO5	Build the programs using Union and File management Operations.	**K3**

UNIT-I	**Introduction**	**Periods: 09**	
Generation and Classification of Computers - Block Diagram of a Computer –Categories of Software – Network Structure - Number System – Binary – Decimal – Conversion – Algorithm – Pseudo code – Flow Chart.			**CO1**
UNIT-II	**C Programming Basics**	**Periods: 09**	
Introduction to ' C' Programming – Basic structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements.			**CO2**
UNIT-III	**Arrays and Functions**	**Periods: 09**	
Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations- Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion			**CO3**
UNIT-IV	**Structure and Pointers**	**Periods: 09**	
Structure Introduction – Structure definition – Structure declaration – Structure within a structure –Self Referential Structure. Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays -Pointer to Function –Pointer and Structure- Simple programs.			**CO4**
UNIT-V	**Unions and Files**	**Periods: 09**	
Union Introduction - Programs Using Structures and Unions – Introduction to File - File Operations - File Input and Output Functions - Random Access to Files - File System Functions - Command Line Arguments- Storage Classes - Pre-Processor Directives- Dynamic Memory Functions.			**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, 8thEdition,2019.
2. YashvantKanetkar, "Let us C", BPB Publications, 16th Edition, 2017
3. Herbert Schildt," C: The Complete Reference", McGraw Hill, FourthEdition,2014

Reference Books

1. Vikas B. Agarwal Jyoti P. Mirani, "Computer Fundamentals , Nirali Prakashan Aug-2019,
2. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression,2012.
3. VikasVerma, "A Workbook on C ", Cengage Learning, Second Edition,2012.
4. P.Visu, R.Srinivasan and S.Koteeswaran, "Fundamentals of Computing and Programming", Fourth Edition, Sri Krishna Publications, 2012.
5. PradipDev, ManasGhoush, "Programming in C", Second Edition, Oxford University Press, 2011.

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1. https://www.programiz.com/c-programming
2. https://www.geeksforgeeks.org/c-language-set-1-introduction/
3. https://www.tutorialspoint.com/cprogramming
4. https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c
5. https://nptel.ac.in/courses/106/104/106104128/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**II**	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23CET201**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Mechanics of Solids – I**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	Engineering Mechanics		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the concepts of stress and strain in simple and composite bars	**K2**
	CO2	Determine the shear force and bending moment diagrams of a beam and find the maximum shear/moment and their locations	**K3**
	CO3	Analyze the bending stresses in beams	**K3**
	CO4	Analyze the shear stresses in beams and the critical load on columns	**K3**
	CO5	Evaluate the stresses and deformation in shafts and springs	**K3**

UNIT-I	**Stress, Strain and Deformation of bodies**	**Periods: 09**	
Rigid Bodies and Deformable Solids – Stability, Strength, Stiffness – Tension, Compression and Shear Stresses – Strain, Elasticity, Hooke's Law, Limit of Proportionality, Modulus of Elasticity, Stress-Strain Curve, Lateral Strain – Deformation of Simple and Compound Bars – Temperature Stresses – Shear Modulus, Bulk Modulus, Poisson's Ratio – Relationship between Elastic Constants – Volumetric Strain			**CO1**
UNIT-II	**Transverse Loading on Beams**	**Periods: 09**	
Beams – Types of Supports – Types of Load – Concentrated, Uniformly Distributed, Uniformly Varying Load, Combination of above Loading – Sign Conventions – Relationship between Load, Shear Force and Bending Moment – Bending Moment Diagram and Shear Force Diagram for Cantilever, Simply Supported and Over Hanging Beams			**CO2**
UNIT-III	**Bending Stress in Beams**	**Periods: 09**	
Theory of Simple or Pure Bending – Assumptions – Expression for bending stress – Neutral Axis and Moment of Resistance – Section Modulus and its Various shapes – Bending stress distribution for Symmetrical sections like Rectangular Section, Solid Circular Section and Hollow Circular Section, I-Section and T-Section			**CO3**
UNIT-IV	**Shear Stress and Theory of Column**	**Periods: 09**	
Variation of Shear Stress – Shear stress distribution for Symmetrical sections like Rectangular section, Solid Circular Section, I-Section and T-Section - Column and strut – Classification of columns - Slenderness ratio – Buckling load and factor - Effective length – Various end conditions - Euler's theory, assumptions, formula and limitations - Rankine's formula – Crippling load and Safe load.			**CO4**
UNIT-V	**Torsion and Springs**	**Periods: 09**	
Theory of simple torsion – Assumptions – Torsional Rigidity - Stresses and Deformation in Circular (Solid and Hollow) Shafts – Shafts fixed at both ends – Modulus of Rupture – Power transmitted to shaft – Helical Springs (Closed coiled and Open coiled) – Leaf Springs – Deflection of Springs			**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. R.K.Bansal, "A Textbook of Strength of Materials", Sixth Edition, Laxmi Publications, New Delhi, 2018
2. R.K.Rajput, "Strength of Materials", Sixth Edition, S. Chand Publications, New Delhi 2015
3. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Mechanics of Materials", Laxmi Publications, 2017

Reference Books

1. S.Ramamrutham, R. Narayan, "Theory of Structures", Dhanpat Rai and Co., 11sth Edition, January 2020
2. S. Jose and Dr. Sudhi Mary Kurian, " Mechanics of Solids", Pentagon Educational Services, 2nd Edition, 2018.
3. Junnarkar, S.B. and Shah, H.J., "Mechanics of structures, Vol.I, II", 24rd Edition, Charotar Publishing House, India, 2015.
4. Subramanian R. "Strength of materials", 3rd Edition, Oxford University Press, New Delhi, 2016.
5. R. P. Rethaliya," Mechanics of Solids", Shree Hari Publications, January 2021

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1. https://nptel.ac.in/courses/105/102/105102090/
2. https://nptel.ac.in/courses/105/104/105104160/
3. https://nptel.ac.in/courses/105/106/105106116/
4. https://nptel.ac.in/content/storage2/courses/105105104/pdf/m10l21.pdf
5. https://nptel.ac.in/content/storage2/courses/112105125/pdf/Module-2_Lesson-1.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	2	-	-	3	-	-	-	-	-	1	3	3
2	3	3	2	-	-	3	-	-	-	-	-	1	3	3
3	3	3	2	-	-	3	-	-	-	-	-	1	3	3
4	3	3	2	-	-	3	-	-	-	-	-	1	3	3
5	3	3	2	-	-	3	-	-	-	-	-	1	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**II**	Course Category Code: P**C**			*End Semester Exam Type: **TE**			
Course Code	**U23CET202**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Building Materials and Construction**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	Basics of Civil Engineering	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Identify the building materials and processing of timber and its defects	**K2**
	CO2 Prevent dampness, waterproofing and damp proofing materials used in the construction	**K2**
	CO3 Apply various types of temporary structures and its applications in construction	**K2**
	CO4 Provide efficient, safe, accessible and sustainable movement within buildings	**K2**
	CO5 Exhibit the knowledge of building finishes and form work requirements	**K2**

UNIT-I	**Modern Construction Materials**	**Periods: 09**
Modern materials – Neoprene, Thermocole, decorative panels and laminates, Architectural glass and ceramics, Ferrocement, PVC, Polymer base materials, Fibre reinforced plastics – Timber – Seasoning of Timber – Timber based materials - Preservation and treatment of timber		**CO1**

UNIT-II	**Temporary Structures**	**Periods: 09**
Introduction- Classification of Temporary structures – Scaffoldings – Technical terms used – Brick layers, Mason's, Needle, suspended, Ladder and Tubular Scaffolding – Shoring – Pile and Pit Method –– Underpinning – Method of underpinning – Centering and Shuttering		**CO2**

UNIT-III	**Vertical Transportation**	**Periods: 09**
Definition – Technical terms – Requirements of good stairs – Types of stairs - Straight, Dog Legged, Open Newel, Quarter Turn, Bifurcated, Geometrical and Spiral stairs – Lifts – Ramps – Escalators		**CO3**

UNIT-IV	**Paints, Varnishes and Distempers**	**Periods: 09**
Paints – Varnish – Distemper – Purpose, Types, Ingredients and Defects, Preparation and applications to new and old plastered surfaces, wooden and steel surfaces		**CO4**

UNIT-V	**Damp Proofing , Waterproofing and Anti Termite Treatment**	**Periods: 09**
Definition of technical terms – Defects – Sources – Prevention – Damp proofing and terrace water proofing methods – Pre and Post construction anti termite treatment		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. S. K. Duggal, "Building Materials", (Fifth Edition), New Age Publishers, 2019
2. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, "Building Construction, Laxmi Publications Pvt Ltd., New Delhi, 2008
3. S.C. Rangawala "Building Construction", Charotar Publishing House Pvt. Ltd., India, 2022

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1. S.S.Bhavikatti, "Building Materials", Vikas Publishing House, January 2012
2. P.C. Varghese, "Building Materials", Prentice-Hall of India Pvt. Ltd., New Delhi, 2nd Edition 2015
3. Arora . S.P. Bindra S.P . A Test book of Building Construction, Dhanpat rai & Co, New Delhi, 2010.
4. Sushil Kumar, "Building Construction", Standard Publishers Distributors, 20th Edition
5. M L Gambhir, "Building Materials", McGraw Hill Education; 1st edition, 2017

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2. https://nptel.ac.in/courses/105/102/105102088/

3. https://nptel.ac.in/courses/124/105/124105013/
4. https://nptel.ac.in/courses/105/106/105106053/
5. https://www.nerolac.com/blog/what-is-damp-proofing-and-difference-from-waterproofing

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	1	2	-	-	-	-	-	-	-	-	1	-	-
2	3	1	2	-	-	-	-	-	-	-	-	1	-	-
3	3	1	2	-	-	-	-	-	-	-	-	1	-	-
4	3	1	2	-	-	-	-	-	-	-	-	1	-	-
5	3	1	2	-	-	-	-	-	-	-	-	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**II**	Course Category Code: **HS**			End Semester Exam Type: **TE**			
Course Code	**U23HSTC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Universal Human Values - II**	**2**	**0**	**0**	**2**	**25**	**75**	**100**
	(Common to all Branch)							
Prerequisite	UHV - I							

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Evaluate the significance of value inputs in formal education and start applying them in their life and profession	**K2**
	CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	**K2**
	CO3	Analyze the value of harmonious relationship based on trust and respect in their life and profession	**K2**
	CO4	Examine the role of a human being in ensuring harmony in society and nature.	**K2**
	CO5	Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.	**K2**

UNIT - I	**Introduction to Value Education**	**Periods: 06**
Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) - Understanding Value Education - Self-exploration as the Process for Value Education - Basic Human Aspirations - Happiness and Prosperity - Current Scenario- Method to Fulfil the Basic Human Aspirations		**CO1**
UNIT - II	**Harmony in the Human Being**	**Periods: 06**
Understanding Human being as the Co-existence of the Self and the Body-Distinguishing between the Needs of the Self and the Body-The Body as an Instrument of the Self-Understanding Harmony in the Self-Harmony of the Self with the Body-Programme to ensure self-regulation and Health		**CO2**
UNIT - III	**Harmony in the Family and Society**	**Periods: 06**
Harmony in the Family - Basic Unit of Human Interaction- 'trust' - Foundational Value in Relationship - 'Respect' - as the Right Evaluation - Other Feelings, Justice in Human-to-Human Relationship - Understanding Harmony in the Society-Vision for the Universal Human Order.		**CO3**
UNIT - IV	**Harmony in the Nature / Existence**	**Periods: 06**
Understanding Harmony in the Nature-Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature - Realizing Existence as Co-existence at All Levels - Holistic Perception of Harmony in Existence		**CO4**
UNIT - V	**Implications of the Holistic Understanding - A Look At Professional Ethics**	**Periods: 06**
Natural Acceptance of Human Values - Definitiveness of (Ethical) Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Competence in Professional Ethics-Holistic Technologies, Production Systems and Management Models-Typical Case Studies-Strategies for Transition towards Value - based Life and Profession		**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Text Book

1. R. R. Gaur, R. Asthana, G. P. Bagaria, "A Foundation Course in Human Values and Professional Ethics", Excel Books, 2nd Revised Edition, New Delhi, 2019.

Reference Books

1. A Nagraj, Jeevan Vidya Prakashan, Amarkantak, "Jeevan Vidya: EkParichaya", 2013.
2. A.N. Tripathi, "Human Values", New Age International Publishers, New Delhi, 3rd Edition, 2019.

3. Annie Leonard, “The Story of Stuff”, Free Press, Reprint Edition, 2011.
4. Mohandas Karam chand Gandhi, “The Story of My Experiments with Truth – Mahatma Gandhi Autobiography”, Finger print Publisher, 2009.
5. E. F Schumacher, “Small is Beautiful”, Vintage Publisher, 1993.
6. Cecile Andrews, “Slow is Beautiful”, New Society Publishers, 2006.
7. J C Kumarappa, “Economy of Permanence”, Sarva Seva Sangh Prakashan, 2017.
8. Pandit Sunderlal, “Bharat Mein Angreji Raj”, Prabhat Prakashan Publisher, 2021.
9. Dharampal, “Rediscovering India”, Stosius Inc/Advent Books Division Publisher, 1983.
10. Mohandas K. Gandhi, “Hind Swaraj or Indian Home Rule”, Gyan Publishing House, 2023.
11. Maulana Abdul Kalam Azad, “India Wins Freedom”, Orient BlackSwan Publisher, 1st Edition, 1988.
12. Life of Vivekananda, **“**Romain Rolland (English)”, Advaita Ashrama Publisher, India, 4th Edition, 2010.
13. Mahatma Gandhi, “Romain Rolland (English)”, Srishti Publishers & Distributors, 2020.

Web References

1. https://www.uhv.org.in/uhv-ii
2. http://www.storyofstuff.com
3. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
4. https://fdp-si.aicte-india.org/8dayUHV_download.php
5. https://www.youtube.com/watch?v=8ovkLRYXIjE

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	2	3	2	2	-	-	3	-	-	-
2	-	-	-	-	-	2	3	2	2	-	-	3	-	-	-
3	-	-	-	-	-	3	3	2	2	-	-	3	-	-	-
4	-	-	-	-	-	2	3	2	2	-	-	3	-	-	-
5	-	-	-	-	-	2	3	2	2	-	-	3	-	-	-

Correlation Level: 1 – Low, 2 – Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**English**	Programme: **B.Tech.**					
Semester	**II**	Course Category : HS			End Semester Exam Type:**TE**		
Course Code	U23ENBC02	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Communicative English - II**	**2**	**0**	**2**	**3**	**50**	**50**	**100**

(Common to ALL Branches except CSBS)

Prerequisite	Basics of English Language	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Draft effective written communication in professional environment	**K2**
	CO2 Apply the mechanics of creative writing with precision and clarity	**K3**
	CO3 Acquire language skills professionally to groom the overall personality through sensitizing various etiquettes in real time situation	**K2**
	CO4 Develop language fluency and gain self-confidence	**K3**
	CO5 Express thoughts and ideas with clarity and focus	**K2**

UNIT-I	**Business Correspondence**	**Periods:10**	
	Business Writing: Circular, Agenda, Memoranda, Notice, Instruction, Minutes, Email Writing ,Report Writing- Official and Demi Official Letters : Applying for Educational / Car / Home Loans / Joining Report, Leave Letter, Industrial Visit, In plant Training, Letter to the Editor, Calling for a quotation, Placing Order, Letter of Complaints, Letter seeking Clarification, Resume', Job Application Letter, Bio-data, CV		**CO1**
UNIT-II	**Functional Writing Skills**	**Periods:10**	
	Four Modes of Writing, Sentence Structure , Art of condensation: Summary Writing and Note Making, Use of phrase and clause in sentence, Principles of paragraph writing, Techniques of Essay Writing, Jumbled Sentence, Paraphrasing		**CO2**
UNIT-III	**Etiquettes**	**Periods:10**	
	Etiquette: Meaning, Kinds: Corporate Etiquette, Meeting Etiquette, Telephone Etiquette, Email Etiquette, Social Media Etiquette, Dining Etiquette, Communication Etiquette		**CO3**
UNIT-IV	**Communication Practice-II**	**Periods:15**	
	List of Exercises **Listening:** Letter writing tips **Speaking:** Just a Minute, Impromptu Speech, Contemporary Issues **Reading:** Variety of examples for Modes of Writing **Writing:** Different types of letters		**CO4**
UNIT-V	**Interpersonal Communication-II**	**Periods:15**	
	List of Exercises **Listening:** Videos on different types of Etiquettes **Speaking:** Team Presentation, Negotiation Skills **Reading:** Phrases and Clauses **Writing:** Free writing on any given topic, Paraphrasing Practice		**CO5**

LecturePeriods:30	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:60**

Text Books

1. PC Das, "Letter Writing including Official and Business Letters", New Central Book Agency, 2020.
2. Kumar, Sanjay, Pushpalatha," Communication Skills". Oxford University Press, 2018.
3. Raman, Meenakshi&Sangeetha Sharma," Communication Skills", New Delhi: OUP,2018.

Reference Books

1. Sahukar, Nimeran , Bhalla, Prem,, "The book of Etiquettes and Manners".PustakMahal Publisher, New Delhi; 1st Edition 2009.
2. Gerson Sharon J, Steven M. Gerson, "Technical Writing Process and Product", Pearson Education Pvt. Ltd. 3rd Edition, 2009.
3. Grussendorf, Marion, "English for Presentations". Oxford University Press, Oxford, 2007.
4. Seely John, "The Oxford Guide to Writing and Speaking", Oxford University Press, 2006.
5. R.C. Sharma, Krishna Mohan, "Business Correspondence and Report Writing", Tata McGraw Hill &Co.Ltd., New Delhi, 2001.

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1. https://www.indeed.com/career-advice/finding-a-job/how-to-write-an-application-letter 2. https://owlcation.com/humanities/Four-Types-of-Writing 3. https://targetstudy.com/languages/english/paragraph-writing.html 4. https://www.businessnewsdaily.com/8262-email-etiquette-tips.html 5. https://www.youtube.com/watch?v=UOceysteIjo

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
2	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
3	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
4	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-
5	1	-	-	-	-	-	-	-	-	3	-	1	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Theory						
Assessment	Continuous Assessment Marks (CAM)				End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Attendance		
Marks	5	5	5	5	75	60
	20(to be weighted for 10 marks)				(to be weighted for 50 marks)	

Practical				
Continuous Assessment Internal Evaluation		End Semester Internal Evaluation		Total Marks
30(to be weighted for 10 marks)		30 marks		40
Listening (L)*	10	Listening (L)*	10	
Speaking(S)	5	Speaking(S)	5	
Reading(R)*	10	Reading(R)*	10	
Writing(W)*	5	Writing(W)*	5	

- **LRW components of Practical can be evaluated through Language Lab Software**

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**II**	Course Category Code: **ES**			End Semester Exam Type: **LE**			
Course Code	**U23CSPC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in C Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to All Branches)

Prerequisite	NIL	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Implement logical formulations to solve simple problems leading to specific applications.	**K3**
	CO2 Execute C programs for simple applications making use of basic constructs, arrays and strings.	**K3**
	CO3 Experiment C programs involving functions, recursion, pointers, and structures.	**K3**
	CO4 Demonstrate applications using sequential and random access file processing.	**K3**
	CO5 Build solutions for online coding challenges.	**K3**

List of Exercises

1. Write a C program to find the Area of the triangle.
2. Develop a C program to read a three digit number and produce output like
   1 hundreds
   7 tens
   2 units
   For an input of 172.
3. Write a C program to check whether a given character is vowel or not using Switch – Case statement.
4. Write a C program to Print the numbers from 1 to 10 along with their squares.
5. Demonstrate do—While loop in C to find the sum of ‘n’ numbers.
6. Find the factorial of a given number using Functions in C.
7. Write a C program to check whether a given string is palindrome or not?
8. Write a C program to check whether a value is prime or not?
9. Develop a C program to swap two numbers using call by value and call by reference.
10. Construct a C program to find the smallest and largest element in an array.
11. Implement matrix multiplication using C program.
12. Write a C program to perform various string handling functions like strlen, strcpy, strcat, strcmp.
13. Develop a C program to remove all characters in a string except alphabets.
14. Write a C program to find the sum of an integer array using pointers.
15. Write a C program to find the Maximum element in an integer array using pointers.
16. Construct a C program to display Employee details using Structures
17. Write a C program to display the contents of a file on the monitor screen.
18. Write a File by getting the input from the keyboard and retrieve the contents of the file using file operation commands.
19. Write a C program to create two files with a set of values. Merge the two file contents to form a single file
20. Write a C program to pass the parameter using command line arguments.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Zed A Shaw,”Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C)”, Addison Wesley,2016.
2. Anita Goel and Ajay Mittal, ”Computer Fundamentals and programming in C”,Pearson Education,First edition, 2011.
3. Maureen Sprankle,Jim Hubbard,” Problem Solving and Programming Concepts,” Pearson,9th Edition, 2011.
4. Yashwanth Kanethkar, “Let us C”, BPB Publications,13th Edition,2008.
5. B.W.Kernighan and D.M. Ritchie, “The C Programming Language”, Pearson Education, 2nd Edition, 2006

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1. https://alison.com/course/introduction-to-c-programming 2. https://www.geeksforgeeks.org/c-programming-language/ 3. http://cad-lab.github.io/cadlab_data/files/1993_prog_in_c.pdf 4. https://www.tenouk.com/clabworksheet/clabworksheet.html 5. https://fresh2refresh.com/c-programming/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Mechanical Engineering**	Programme : **B.Tech.**						
Semester	**II**	Course Category Code: **ES**			End Semester Exam Type: **LE**			
Course Code	**U23ESPC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Graphics Using AutoCAD**	**-**	**-**	**2**	**1**	**50**	**50**	**100**
(Common to all Branches)								
Prerequisite	Nil							

Course Outcomes		**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1	Familiarize with the fundamentals and standards of engineering graphics.	**K3**
	CO2	Perform drawing of basic geometrical constructions and multiple views of objects.	**K2**
	CO3	Visualize the isometric and perspective sections of simple solids.	**K3**
	CO4	Connect side view associate on front view.	**K4**
	CO5	Correlate sectional views and lateral surface developments of various solids.	**K4**

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 a Title Block with necessary text and projection symbol.
3. Drawing 2D sketch by applying modify tools like fillet, mirror, array, etc.,
4. Drawing 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. Simple stool, V-block, Mixie Base).
6. Drawing a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
8. Drawing lateral surface development of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creating 3D model of simple object and obtaining 2D multi-view drawings.
11. Note: Plotting of drawings must be made for each exercise and attached to the records written by Students.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. James D. Bethune, Engineering Graphics with AutoCAD A Spectrum book 1st Edition, Macromedia Press, Pearson, 2020.
2. NS Parthasarathy and Vela Murali, Engineering Drawing, Oxford university press, 2015.
3. M.B Shah, Engineering Graphics, ITL Education Solutions Limited, Pearson **Education** Publication, 2011.
4. Bhatt N.D and Panchal V.M, Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House, 2017.
5. Jeyapoovan T, Engineering Drawing and Graphics Using AutoCAD, Vikas Publishing House Pvt Ltd., 7th Edition, New Delhi, 2016.
6. C M Agrawal, Basant Agrawal, Engineering Graphics, McGraw Hill, 2012.
7. Dhananjay A. Jolhe, Engineering Drawing: With An Introduction To CAD McGraw Hill, 2016.
8. James Leach, AutoCAD 2017 Instructor, SDC Publications, 2016.

Web References

1. http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/egraphics_lab/labs/index.php
2. http://www.nptelvideos.in/2012/12/computer-aided-design.html
3. https://mech.iitm.ac.in/meiitm/course/cad-in-manufacturing/
4. https://autocadtutorials.com
5. https://dwgmodels.com

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
2	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
3	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
4	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
5	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**	Programme: **B.Tech.**					
Semester	**II**	Course Category Code: **PC**			*End Semester Exam Type: **LE**		
Course Code	**U23CEP202**	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Strength of Materials Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

Prerequisite	Mechanics of Solids - I	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Conduct tension and torsion test on steel and find out its properties.	(K3)
	CO2 Find out hardness of material and use it to its efficiency.	(K3)
	CO3 Find out the ductile properties of materials.	(K3)
	CO4 Conduct compression tests on spring and wood	(K3)
	CO5 Students will be able to use the suitable brick for the construction purposes based on their properties.	(K3)

List of Experiments:

1. Tension Test on Mild steel
2. Direct Shear Test on Steel Rod Specimens
3. Bend and Re-bend Test on Steel Rod Specimens
4. Brinell Hardness Test on Metal Specimens
5. Rockwell Hardness Test on Metal Specimens
6. Impact Test on Metal Specimens using Izod arrangement
7. Impact Test on Metal Specimens using Charpy arrangement
8. Ductility Test on Sheet metals using Erichsen Cupping
9. Torsion Test on Metal Specimens
10. Test on open coil helical spring
11. Test on closed coil helical spring
12. Compression Test on wood Specimens- Parallel and Perpendicular to the Grains.
13. Test on Brick
    (i) Compression Test
    (ii) Efflorescence
    (iii) Water absorption test

Lecture Periods: - 00	**Tutorial Periods: -00**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1.Bansal R.K, “Strength of Materials” , Lakshmi Publications Ltd, New Delhi, 2022

2. Gere J.M. and Goodno, B.J., “Mechanics of Materials”, CENGAGE Learning Custom Publishing; 9th edition, 2017.

3.Punmia B.C and Jain A.K., “mechanics of Materials”, Laxmi Publications Ltd, New Delhi, 2018.

4.IS 1608 (2005): Mechanical testing of metals - Tensile Testing

5.IS 10175-(Part 1) 1993 : Mechanical testing of metals -Modified Erichsen cupping test

6.IS1786-2008 (Fourth Revision, Reaffirmed 2013), ‘High strength deformed bars and wires for concrete reinforcement – Specification’, 2008.

Web References

1. https://www.coursera.org/learn/mechanics-1
2. https://nptel.ac.in/courses/105/104/105104160/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	3	-	2	-	-	2	-	-	1	2	3	3
2	3	2	-	3	-	2	-	-	2	-	-	1	2	3	3
3	3	2	-	3	-	2	-	-	2	-	-	1	2	3	3
4	3	2	-	2	-	2	-	-	2	-	-	1	2	3	3
5	3	2	-	2	-	2	-	-	2	-	-	1	2	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**II**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23CEC2XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Certification Course - II**	**0**	**0**	**4**	**-**	**100**	**-**	**100**
CIVIL								
Prerequisite	**-**							

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(iv) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(v) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as “pass” on satisfactory completion. A letter grade “P” is awarded to declare pass.

(vi) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**		**Total Marks**
	Attendance	**MCQ Test**	
Marks	**10**	**90**	**100**

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**II**	Course Category : **MC**			End Semester Exam Type: -			
Course Code	**U23CEM202**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Sports Yoga and NSS**	0	0	2	Non-Credit	100	-	100
Prerequisite	**-**							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility and relaxation.	**K2**
	CO2 Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.	**K2**
	CO3 Develop understanding of psychological problems associated with age and lifestyle.	**K2**
	CO4 Recognize the importance of national service in community development.	**K2**
	CO5 Convert existing skills into socially relevant life skills.	**K2**

UNIT-I	**Introduction to Physical Education**	**Periods: 06**
Definition, Aims and Objectives of Physical Education - Changing trends in Physical Education **Physical Fitness, Wellness and Lifestyle:** Importance of Physical Fitness and Wellness - Components of Physical fitness -Components of Health related fitness - Components of wellness - Preventing Health Threats through Lifestyle Change - Concept of Positive Lifestyle.		**CO1**
UNIT-II	**Yoga and Lifestyle**	**Periods: 06**
Importance of Yoga - Elements of Yoga - Introduction - Asanas, Pranayama, Meditation and Yogic Kriyas - Yoga for concentration and related Asanas (Sukhasana, Tadasana, Padmasana and Shashankasana) - Relaxation Techniques for improving concentration - Yog-nidra. Asanas as preventive measures – Hypertension – Obesity - Back Pain-Diabetes - Asthema.		**CO2**
UNIT-III	**Training and Planning in Sports**	**Periods: 06**
Training - Warming up and limbering down-Skill, Technique and Style - Objectives of Planning – Tournament - Knock-Out, League/Round Robin and Combination. **Psychology and Sports** - Important of Psychology in Physical Education and Sports - Differentiate Between Growth and Development - Adolescent problems and their Management - Emotion: Concept, Type and Controlling of emotions - Concepts and Types of Aggressions in Sports - Psychological benefits of exercise - Anxiety and Fear and its effects on Sports Performance - Motivation, its type and techniques - Understanding Stress and Coping strategies		**CO3**
UNIT-IV	**Introduction to National Service Scheme**	**Periods: 06**
Orientation of NSS volunteers: History, motto, symbol, awards, structure and activities of NSS - Days of National and International Importance - Sensitizing about the thrust areas and awareness activities - Importance of tree plantation and voluntary blood donation - The role of SHGs and NGOs in community development – CSR - Life skills and youth development-extension activities in HEIs - various clubs and schemes like RRC, ELC, YRC, UBA, SBA, etc.,		**CO4**
UNIT-V	**Community issues and the use of technology**	**Periods: 06**
Common Problems of rural India - Technology development and its suitability – Sustainability - Value addition to agricultural products - Service learning and youth volunteering – Shramdaan - Campus cleaning - Field visit to nearby communities - village survey - Initiatives to clean and green environment - preservation of water bodies in adopted villages.		**CO5**

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Brar Ajmer Singh, Gill Jagtar Singh, Bains Jagdish, “Modern Textbook of Physical Education Health and Sports- I”, Kalyani Publishers , 6th Edition, 2014

2. B.K.S. Iyengar, “Light on Yoga: The Definitive Guide to Yoga Practice”,Thorsons Publishers, Thorsons Classics edition, 2015

3. Joseph, Siby K, Mahodaya, “Bharat Essays on Conflict Resolution”, Institute of Gandhian Studies Publishers, 2007
4. Barman Prateeti , Goswami, “Document on Peace Education”, Triveni Akansha Publishing House, New Delhi, 2009
5. Prof R.B.S. Verma, “Field Work Practicum in Social Work-Emerging Concerns”, Rapid Publisher, Lucknow, 2020
6. Sibereisen, K , Richard M, “Lerner Approaches to Positive Youth Development”, Sage Publications, New Delhi, 2007
7. Hoshiar Singh, “Administration of Rural Development in India”,Sterling Publisher, the University of Michigan, 2009

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1. http://www.thebetterindia.com/140/national-service-scheme-nss
2. http://en.wikipedia.org/wiki/national-service-scheme 19=http://nss.nic.in/adminstruct
3. http://nss.nic. in
4. http://socialworknss.org/about.html
5. Young Journal on Youth published by SAGE: http://you.sagepub.com

Evaluation methods

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	**MCQ Test**	**Presentation / Activity / Assignment**	
Marks	10	30	60	100

III SEMESTER SYLLABUS

Department	**Mathematics**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code:**BS**			*End Semester Exam Type: **TE**			
Course Code	**U23MATC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Probability and Statistics**	**3**	**1**	**0**	**4**	**25**	**75**	**100**
(Common to All Branches Except CSBS)								

Prerequisite	Basic Probability		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the concept of probability.	**K3**
	CO2	Solve the problem on Random variables.	**K3**
	CO3	Understand the concepts of Analysis of variance.	**K3**
	CO4	Learn the .applications of Large Samples.	**K3**
	CO5	Analyze the problems in small samples.	**K3**

UNIT – I	**THEORY OF PROBABILITY**	**Periods:12**	
Random Experiments - Sample Space - Exhaustive events- Axioms of probability – Conditional probability – Total probability – Bayes theorem.			**CO1**
UNIT – II	**RANDOM VARIABLES**	**Periods:12**	
Discrete Random Variable – Binomial distribution – Poisson distribution. Continuous Random Variable – Exponential distribution – Normal distribution (Excluding Derivation of Mean, Variance and MGF)			**CO2**
UNIT – III	**STATISTICS & ANALYSIS OF VARIANCES**	**Periods:12**	
Correlation – Rank correlation and Regression. Analysis of variance: One-way classifications. and two-way classifications.			**CO3**
UNIT – IV	**LARGE SAMPLES**	**Periods:12**	
Large Samples: Single Propositions – Difference of Proportions – Single Mean – Difference of Mean – Difference of Standard Deviations			**CO4**
UNIT – V	**SMALL SAMPLES**	**Periods:12**	
Test for Single and Difference Mean – Test for Ratio of Variances – Chi-Square test for Goodness of Fit and Independence of Attributes.			**CO5**

Lecture Periods:45	**Tutorial Periods:15**	**Practical Periods: -**	**Total Periods:60**

Text Books

1. T. Veerarajan, “Probability, Statistics and Random Processes”, Tata McGraw-Hill, 3rd Edition, 2008.
2. A. Singaravelu, “Probability and Statistics”, Meenakshi Agency, 2019.
3. S.C. Gupta, V.K. Kapur “Fundamental of Mathematical Statistics” Sultan Chand & sons, 12th Edition, 2022.

Reference Books

1. B.S. Grewal, “Higher Engineering Mathematics”, Khanna publishers, 3rd Edition,2017
2. William Mendenhall, Robert J. Beaver and Barbara M. Beaver: “Introduction to Probability & Statistics”, Cengage Learning, 15thEdition, 2019.
3. Richard. A. Johnson, Irwin Miller and John E. Freund,” Probability and Statistics for Engineers”, Pearson Education, Asia, 9th Edition, 2018.
4. Vijay K. Rohatgi and A.K. Md. Ehsanes Saleh, “An Introduction to Probability and Statistics”, Wiley, 3rd Edition 2008.

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1. www.stat110.net
2. http://www.nptel.ac.in/courses/111105035 (R.V)
3. http:// www.probabilitycourse.com.
4. www.edx.org/Probability
5. http://www2.aueb.gr/users/demos/pro-stat.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	1	2	1	1
2	3	2	1	1	-	-	-	-	-	-	-	1	2	1	1
3	2	2	-	-	-	1	-	-	-	-	-	1	2	1	1
4	3	2	1	1	-	1	-	-	-	1	-	1	2	1	1
5	3	2	1	1	-	1	-	-	-	1	-	1	2	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Artificial Intelligence and Data Science**	Programme: **B.Tech**						
Semester	**III**	Course Category : **ES**			End Semester Exam Type: **TE**			
Course Code	**U23ADTC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in Python**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
(Common to All Branches)								
Prerequisite	NIL							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Interpret the basic concepts of Python programs.	**K2**
	CO2 Articulate the concepts of Sets, Dictionaries and Object-Oriented concepts.	**K2**
	CO3 Experiment with Numpy package.	**K3**
	CO4 Apply and analyze Data Manipulation with Pandas.	**K3**
	CO5 Illustrate programming concept for Visualization with Matplotlib.	**K3**

UNIT-I	**Introduction to Python**	**Periods: 09**	
Structure of Python Program – Underlying mechanism of Module Execution – Branching and Looping – Problem Solving Using Branches and Loops – Functions – Lambda Functions – Lists and Mutability – Problem Solving Using Lists and Functions.			**CO 1**
UNIT-II	**Sequence Datatypes and Object-Oriented Programming**	**Periods: 09**	
Sequences – Mapping and Sets – Dictionaries. Classes: Classes and Instances – Inheritance – Exception Handling – Introduction to Regular Expressions using "re" module.			**CO 2**
UNIT-III	**Using Numpy**	**Periods: 09**	
Basics of NumPy – Computation on NumPy – Aggregations – Computation on Arrays – Comparisons – Masks and Boolean Arrays – Fancy Indexing – Sorting Arrays – Structured Data: NumPy's Structured Array.			**CO 3**
UNIT-IV	**Data Manipulation with Pandas**	**Periods: 09**	
Introduction to Pandas Objects – Data indexing and Selection – Operating on Data in Pandas – Handling Missing Data – Hierarchical Indexing – Combining Data Sets. Aggregation and Grouping – Pivot Tables –Vectorized String Operations – Working with Time Series – High Performance Pandas – eval() and query().			**CO 4**
UNIT-V	**Visualization With Matplotlib**	**Periods: 09**	
Basic functions of Matplotlib – Simple Line Plot – Scatter Plot – Density and Contour Plots – Histograms – Binnings and Density – Customizing Plot Legends – Colour Bars – Three-Dimensional Plotting in Matplotlib.			**CO 5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods:**	**Total Periods: 45**

Text Books

1. Jake VanderPlas, "Python Data Science Handbook - Essential Tools for Working with Data", O'Reily Media Inc, 2016.
2. Zhang.Y, "An Introduction to Python and Computer Programming", Springer Publications, 2016.
3. Wesley J Chun, "Core Python Programming", Pearson Education, 2nd Edition, 2006.

Reference Books

1. John Paul Mueller, Luca Massaron, "Python for Data Science for Dummies", 2nd Edition, John Wiley& Sons, 2019.
2. Jesus Rogel-Salazar, "Data Science and Analytics with Python", CRC Press Taylor and Francis Group, 2017.
3. Brian Draper, "Python Programming A Complete Guide for Beginners to Master and Become an Expert in Python Programming Language", CreateSpace Independent Publishing Platform, 2016.
4. Mark Lutz, Laura Lewin, Frank Willison, "Programming Python", O'Reilly Media, 3rd Edition, 2006.
5. Gowrishankar S, Veena A, "Introduction to Python Programming", CRC Press, 2018.

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1. https://nptel.ac.in/courses/106/106/106106212/

2. https://www.geeksforgeeks.org/data-analysis-visualization-python/
3. https://www.coursera.org/learn/python-data-analysis
4. https://www.python.org/
5. https://www.programiz.com/python-programming

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
2	2	2	1	3	-	-	-	-	-	-	-	2	2	2	3
3	3	2	2	3	-	-	-	-	-	-	-	2	3	2	3
4	3	3	2	3	-	-	-	-	-	-	-	3	3	3	3
5	3	3	2	3	-	-	-	-	-	-	-	2	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CET303**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Fluid Mechanics and Machinery**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite								

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Appraise the various properties of fluids and characteristics	**K3**
	CO2 Analyse and calculate flow through circular conduits	**K4**
	CO3 Apply mathematical knowledge to predict the flow measurement and dimensional analysis	**K5**
	CO4 Mathematically predict the nature of flow through pipes	**K4**
	CO5 Distinguish the components, functions and uses of pumps and turbines	**K4**

UNIT – I	**FLUID PROPERTIES AND FLOW CHARACTERISTICS**	**Periods:09**
Properties of fluids - Mass density, Specific weight, Specific gravity, Viscosity, Surface tension, Capillarity, Bulk modulus, Compressibility - Hydrostatics – Pressure – Static, absolute and gauge pressure – Forces on planes – Center of pressure – Buoyancy and floatation. Flow characteristics – concept of control volume – application of continuity equation, energy equation and momentum equation.		**CO1**

UNIT – II	**FLOW THROUGH CIRCULAR CONDUITS**	**Periods:09**
Boundary Layer Theory: Boundary Layer thickness - Displacement thickness, Momentum thickness, Energy thickness, Boundary layer growth and separation. Laminar flow: Laminar flow through pipes, Hagen - poissuille flow, energy loss. Turbulent flow: Turbulent flow through pipes, Darcy's equation, Minor losses, Energy and hydraulic gradients, pipes in series and parallel.		**CO2**

UNIT – III	**FLOW MEASUREMENT AND DIMENSIONAL ANALYSIS**	**Periods:09**
Continuity equation – Euler's equation - Bernoulli's equation – Applications – Venturimeter, Orificemeter and Pitot tube – Orifice and Mouthpiece – Notches / Weirs - Rectangular and Triangular types – End contraction – Velocity of approach. Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis		**CO3**

UNIT – IV	**OPEN CHANNEL FLOW**	**Periods:09**
Hydraulics Channel - Energy-depth relationships, specific energy, critical flow, hydraulic jump, uniform flow, gradually varied flow and water surface profiles.		**CO4**

UNIT – V	**PUMPS AND TURBINES**	**Periods:09**
Centrifugal pumps– working principle- work done by the impeller – performance curves – Reciprocating pump- working principle – Rotary pumps –classification. Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles – work done by water on the runner – draft tube.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2013.
2. Dr. R.K. Bansal "Fluid Mechanics and Hydraulic Machines", 9th edition, Laxmi Publication, 2017
3. Jain.A.K.. "Fluid Mechanics" (Including Hydraulic Machines), Twelfth Edition, Khanna Publishers, 2016

Reference Books

1. Graebel. W.P, "Engineering Fluid Mechanics", Taylor and Francis, Indian Reprint, 2011

2. Kumar K. L. "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd. New Delhi 2016
3. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, “Fluid Mechanics and Machinery”, 2011.
4. Streeter, V. L. and Wylie E. B. "Fluid Mechanics", McGraw Hill Publishing Co. 2010
5. John A.Roberson, "Hydraulic Engineering", John Wiley andSons,Incorporated, 201
Web References
1.https://nptel.ac.in/courses/105/103/105103192/
2.https://www.youtube.com/watch?v=fa0zHI6nLUo&list=PLbMVogVj5nJTZJHsH6uLCO00I-ffGyBEm
3.https://www.coursera.org/courses?query=fluid%20mechanics
4.https://www.classcentral.com/course/swayam-introduction-to-fluid-mechanics-7945
5.https://www.udemy.com/topic/fluid-mechanics

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	1	-	2	1	1	-	-	-	1	3	-	-
2	3	2	1	1	-	1	1	-	-	-	1	3	-	-
3	3	2	1	1	-	1	1	-	-	-	1	3	-	-
4	3	2	1	1	-	1	1	-	-	-	1	3	-	-
5	2	2	1	-	-	-	1	-	-	-	1	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23CET304**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Construction Technique, Equipment and Practices**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**Building Material and Construction**		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Know the different construction techniques and structural systems	**K2**
	CO2	Predict the earth moving equipment for different types of work	**K2**
	CO3	Apply the various construction practices in the field	**K2**
	CO4	Know about the concrete equipment in the construction filed	**K2**
	CO5	Know the lifting equipment involved in the construction	**K2**

UNIT-I	**Construction Techniques**	**Periods: 09**	
Overview of construction industry sectors - Residential construction, Commercial construction, Civil engineering construction, Industrial construction - Types of construction projects - Construction materials and properties of concrete, steel and wood			**CO1**
UNIT-II	**Construction Equipment**	**Periods: 09**	
Equipment for earth moving operations - Equipment for foundation and pile driving - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling			**CO2**
UNIT-III	**Construction Practices**	**Periods: 09**	
Specifications detailed and sequence of activities and construction - Centering and shuttering - Slip forms - Scaffoldings - De shuttering forms - Fabrication and erection of steel trusses, frames, braced columns			**CO3**
UNIT-IV	**Concrete Equipment**	**Periods: 09**	
Types of concrete mixer machines – Methods of handling and transporting concrete, Consolidation of concrete, Methods of finishing and curing of concrete			**CO4**
UNIT-V	**Lifting Equipment**	**Periods: 09**	
Cranes, crane motions, Principles of lifting mechanism of crane – Types of cranes – Tower crane, Factor affecting lifting capacity of crane			**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Arora S.P. and Bindra S.P. "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 2010.
2. Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2016.
3. Sharma S.C. “Construction Equipment and Management”, Khanna Publishers New Delhi, 2013

Reference Books

1. Peurifoy, R.L. Ledbetter, W.B. and Schexnayder, C. "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 2001.
2. Jha J and Sinha S.K. "Construction and Foundation Engineering", Khanna Publishers,1999.
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.

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1. https://www.eolss.net/sample-chapters/c05/E6-37-03-07.pdf
2. https://rdso.indianrailways.gov.in/works/uploads/File/WKS-R-1.pdf
3. https://www.jswneosteel.in/build/best-practices-in-rcc-construction.aspx
4. https://nuvonirmaan.com/construction-stages/substructure/
5. https://nuvonirmaan.com/construction-stages/superstructure/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	2	-	-	3	-	-	-	-	-	1	3	3
2	3	3	2	-	-	3	-	-	-	-	-	1	3	3
3	3	3	2	-	-	3	-	-	-	-	-	1	3	3
4	3	3	2	-	-	3	-	-	-	-	-	1	3	3
5	3	3	2	-	-	3	-	-	-	-	-	1	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**			Programme : **B.Tech.**				
Semester	**III**			Course Category Code: **PC**		End Semester Exam Type: **TE**		
Course Code	**U23CET305**			Periods/Week		Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	**Mechanics of Solids II**			**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	**Mechanics of Solids I**									
Course Outcomes	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)		
	CO1	Determine the deflection of various types of beams						**K4**		
	CO2	Calculate the strain energy for materials.						**K4**		
	CO3	Analyse the indeterminate structures and draw the shear force and bending moment diagrams for continuous beam.						**K4**		
	CO4	Determine the deflection of trusses and frames.						**K4**		
	CO5	Discuss the theories of failure and also to find the unsymmetrical bending and shear centre of the sections.						**K4**		
UNIT- I	**DEFLECTION OF BEAMS**							**Periods: 09**		
Slope and Deflection – Deflection of cantilever and simply supported beams – Macaulay's method and conjugate beam method.										**CO1**
UNIT- II	**ENERGY PRINCIPLES**							**Periods: 09**		
Strain energy due to application of gradual, sudden and impact load- Principle of virtual displacement- Castigliano's theorem – Simply supported beam										**CO2**
UNIT - III	**INDETERMINATE BEAMS**							**Periods: 09**		
Introduction – Degree of static indeterminacy for beams and frames. Theorem of three moments - analysis of continuous beams - shear force and bending moment diagrams for continuous beams.										**CO3**
UNIT - IV	**DEFLECTION OF TRUSSES AND FRAMES**							**Periods: 09**		
Introduction – Deflection of Trusses – Simply supported and Cantilever - Deflection of Frames - Simply supported and Cantilever – Unit load method/ Strain energy method										**CO4**
UNIT - V	**THEORIES OF FAILURE AND UNSYMMETRICAL BENDING**							**Periods: 09**		
Various theories of failure – Unsymmetrical bending of beams – 'L' and 'T' sections. Shear centre – Channel and I sections										**CO5**
Lecture Periods: 45		**Tutorial Periods: -**			**Practical Periods: -**			**Total Periods: 45**		

Text Books

1.R.K.Bansal, "A Text Book of Strength of materials", Laxmi Publications, Sixth Edition, 2018.
2.R.K.Rajput, "Strength of materials", S. Chand publishers, 7th edition, 2018
3.R. S. Khurmi, "Strength of Materials", S. Chand and Company Ltd, New Delhi, 26th Edition, 2019.

Reference Books

1. Ramamrutham, S. "Strength of Materials", DhanpatRaiand Sons, 18th Edition, 2014
2. V.N. Vazirani, M.M.Ratwani, "Analysis of Structures, Vol-1", Khanna Publishers, New Delhi, 2015.
3. Bhavikatti S S, "Structural Analysis II", Vikas Publishing House Pvt. Ltd, New Delhi, 4rd Edition, 2013
4. Subramanian R. "Strength of materials", 3rd Edition, Oxford University Press, New Delhi, 2016.
5. Dr. R. P. Rathaliya," Mechanics of Solids"AtulPrakashan, 2018.

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1. https://nptel.ac.in/content/storage2/courses/105105109/pdf/m3l15.pdf
2. https://www.youtube.com/watch?v=uMuFpT1gFVI

3. https://youtu.be/6CLEWA2WNqM
4. https://nptel.ac.in/content/storage2/courses/105101085/downloads/lec-24.pdf
5. https://nptel.ac.in/content/storage2/courses/105105109/pdf/m2l12.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	2	3	-	-	-	-	-	-	1	2	-	2
2	3	2	2	3	-	-	-	-	-	-	1	2	-	2
3	3	2	2	3	-	-	-	-	-	-	1	2	-	2
4	3	2	2	3	-	-	-	-	-	-	1	2	-	2
5	3	2	2	3	-	-	-	-	-	-	1	2	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**		Programme: **B.Tech.**					
Semester	**III**		Course Category : **PC**			End Semester Exam Type:**TE**		
Course Code	**U23CEB301**		Periods/Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Surveying and Geomatics**		**2**	**0**	**2**	**3**	**50**	**50**	**100**

Prerequisite	-		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Implement the procedure of Chain Survey to find different distances and areas..	**K2**
	CO2	Determine the reduced level of points using levelling instruments	**K2**
	CO3	Locate the position of the object after finding the distance and heights using theodolite.	**K3**
	CO4	Apply the concepts of tacheometer surveying to find the height and distance of given object.	**K2**
	CO5	Implement the modern survey techniques using Total Station equipment and GPS.	**K3**

UNIT- I	**FUNDAMENTALS OF CONVENTIONAL SURVEYING AND LEVELLING**	**Periods:10**	
Classifications and basic principles of surveying - Methods of ranging - Chain traversing - Obstacles- Tape corrections - Compass - Types of Compass- Basic Principles- Bearing – Types - True Bearing - Magnetic Bearing- Local Attraction – Magnetic declination – Dip- Levelling- Principles and theory of Levelling – Datum- Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling- Booking – Reduction - Sources of errors in Levelling- Curvature and refraction - Contouring - Digital Planimeter – Uses.			**CO1**
UNIT- II	**THEODOLITE AND TACHEOMETRIC SURVEYING**	**Periods:10**	
Horizontal and vertical angle measurements - Temporary and permanent adjustments - Heights and distances - Tacheometer - Stadia Constants - Anallactic Lens - Tacheometry surveying - Tangential and Stadia - Trigonometric levelling.			**CO2**
UNIT- III	**CONTROL SURVEYING AND ADJUSTMENT**	**Periods:10**	
Horizontal and vertical control – Methods – specifications – triangulation- baseline – satellite stations – reduction to centre– single and reciprocal observations – traversing –Sources of errors- precautions and corrections – classification of errors – true and most probable values- weighed observations – method of equal shifts –principle of least squares - normal equation – correlates- level nets- adjustment of simple triangulation networks			**CO3**
UNIT- IV	**LEVELLING & THEODOLITE**	**Periods:15**	
List of Exercises 1.Reduction of Levels: (i) Height of Collimation (ii) Rise and Fall method 2. Fly levelling using Dumpy level 3.Measurements of horizontal angles by reiteration and repetition and vertical angles 4.Determination of Tacheometric Constants 5.Heights and distances by stadia Tacheometry			**CO4**
UNIT-V	**Modern Surveying – Total Station & GPS**	**Periods:15**	
List of Exercises 1. Total Station Surveying – Measurements of Distances and angles, Slope distances, Height, Traversing, setting out, Area and Volume. 2.GPS Surveying – Co-ordinate Measurements			**CO5**

Lecture Periods:30	**Tutorial Periods:-**	**Practical Periods:30**	**Total Periods:60**

Text Books

1. Punmia.B.C. Ashok K.Jain and Arun K Jain , Surveying Vol. I and II, Lakshmi Publications Pvt Ltd, New Delhi, 2016
2. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling, Parts 1 and 2, Pune Vidyarthi Griha Prakashan, Pune, 2014
3. S. K. Duggal, "Surveying, Vol. I and II ", 5th Edition, McGraw Hill, 2019.

Reference Books

1. Venkatramaiah, Text book of Surveying, University press, New Delhi, 2011
2. Subramanian, "Surveying and Levelling", Oxford University Press, 2012
3. Alfred Leick, "GPS satellite surveying", John Wiley and Sons Inc. 4th Edition, 2015.

Web References

1. https://www.allenprecision.com/page/how-to-stake-out-points-and-profile-boards-with-a-total-station/
2. https://www.elprocus.com/how-gps-system-works/
3. https://www.johnsonlevel.com/News/TheodolitesAllAboutTheodo

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	1	1	1	1	-	2	3	-	1	3	3	3
2	3	1	1	1	1	1	-	3	3	-	1	3	3	3
3	3	3	3	3	3	1	-	3	3	-	3	3	3	3
4	3	3	3	3	3	1	-	3	3	-	3	3	3	3
5	3	3	3	3	3	1	-	3	3	-	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Theory						
Assessment	Continuous Assessment Marks (CAM)				End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Attendance		
Marks	5	5	5	5	75	60
	20(to be weighted for 10 marks)				(to be weighted for 50 marks)	

Department	**English**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code:**HS**			*End Semester Exam Type:**LE**			
Course Code	**U23ENPC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**General Proficiency- I**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to ALL Branches except CSBS)

Prerequisite	Basics of English Language		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Interpret meaning and apply reading strategies in technical and non-technical context	**K3**
	CO2	Develop interpersonal communication skills professionally	**K4**
	CO3	Demonstrate various forms of formal writing	**K3**
	CO4	Decode graphical data coherently	**K2**
	CO5	Apply the techniques of verbal aptitude in competitive exams	**K3**

UNIT- I	**COMPREHENSION ANALYSIS**	**Periods:6**	
Listening: Dialogue based on social contexts (IELTS based) - Speaking: Break the iceberg (IELTS based) Submitting Video Recording - Reading: Reading technical passage (IELTS based) - Writing: Writing Task: 2 (IELTS Academic) - Vocabulary: Synonyms (IELTS)			**CO1**
UNIT- II	**PERSONALITY DEVELOPMENT**	**Periods:6**	
Listening: Monologue about the everyday social issues (IELTS based) - Interview Videos - Speaking: Speak about the topic in the Flash Card (IELTS based) - Reading: British & American Vocabulary - Writing: SWOT Analysis - Vocabulary: Idioms and Phrases (IELTS)			**CO2**
UNIT- III	**INFERENTIAL LEARNING**	**Periods:6**	
Listening: Conversation between 4 people regarding education (IELTS based), Anecdotes - Speaking: Structure Discussion (IELTS based) - Reading: Distinguish between facts & opinions (IELTS based), - Writing: Writing Conversation to different context - Vocabulary: Phrasal Verbs (IELTS)			**CO3**
UNIT- IV	**INTERPRETATION AND FUNCTIONAL WRITING**	**Periods:6**	
Listening: Monologue on an academic subject (IELTS based), Group Discussion videos - Speaking: Group Discussion Practice - Reading: Read and review (Books, Magazines) - Writing: Writing Task 1: (IELTS Academic: Graph/ chart/tables description) - Vocabulary: Collocations (IELTS)			**CO4**
UNIT-V	**VERBAL APTITUDE - I**	**Periods:6**	
Language Enhancement: Articles, Preposition, Conjunction **Verbal Ability Enhancement:** Ordering of sentences, Blood Relation, Completing Statements- Cloze test, Spotting Errors - Sentence Improvement, Word Analogy, Word Groups **(GATE)**			**CO5**

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1.Lewis, Norman, "Word Power Made Easy".Goyal Publishers and Distributors Pvt.Ltd. Latest Edition, 2020.
2.Patterson,Kerry, Joseph Grenny,Ron McMillan, Al Switzler, "Crucial Conversation Tools for talking when Stakes are High", Kindle Publication,2nd Edition, 2011.
3.Comfort, Jeremy,et.al. "Speaking Effectively: Developing Speaking Skills for Business English", Cambridge University Press, Cambridge: Reprint 2011.
4.Agarwal, R. S. "A Modern Approach to Verbal & Non Verbal Reasoning". S. Chand, 2010.
5.Wren, Percival Christopher, and Wren Martin. "High School English Grammar and Composition". S Chand, 2005.

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1.https://www.ielts-exam.net/grammar/
2.https://ieltsfocus.com/2017/08/02/collocations-ielts/
3.https://www.fresherslive.com/online-test/blood-relations-questions-and-answers
4.https://www.toppr.com/guides/english-language/reading-comprehension/cloze-test/
5.https://www.examsbook.com/word-analogy-test-questions-with-answers

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
2	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
3	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
4	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
5	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1

Correlation Level: 1-Low, 2-Medium, 3-High

Evaluation Methods

Practical				
Continuous Assessment Internal Evaluation		**End Semester External Evaluation**		**Total Marks**
50 marks		**50 marks**		100
Conduction of Practical (Assignment 1&2 -10 Marks Performance in practical classes - 5 Marks)	15	Listening (L)	20	
Record	5	Speaking(S)	10	
Viva	5	Reading(R)	10	
Model Practical Examination (Model Exam is conducted for 50 Marks that will be converted to 15 Marks)	15	Writing(W)	10	
Attendance	10			

Department	**Mathematics**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **BS**			*End Semester Exam Type: **LE**			
Course Code	U23MAPC01	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Engineering Mathematics Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
(Common to all Branches Except CSBS)								

Prerequisite	Matrices, Fourier Transforms, Laplace Transforms	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 **Perform and evaluate Matrix Operations**	**K3**
	CO2 Solve Differential and Integral Equations	**K3**
	CO3 Construct Fourier series and Fourier Transforms of the given function	**K3**
	CO4 Find the Measures of Central tendency	**K3**
	CO5 Analyze Correlation and Regression lines	**K3**

List of Experiments:

1. Find the Inverse, Rank, Eigen values and Eigen Vectors of the matrix.
2. Solve the first order differential equation.
3. Find the integration of $\int_a^b f(x)dx$.
4. Find the Fourier series of f(x).
5. Find the Fourier Transform of f(x).
6. Find the Laplace Transform of f(x).
7. Find the Mean, Median and Mode.
8. Construct the Pie and Bar Diagram.
9. Find the Correlation coefficient.
10. Find the Regression lines.

Lecture Periods:- Nil	**Tutorial Periods:- Nil**	**Practical Periods: 3 0**	**Total Periods :30**

Reference Books

1. T. Veerarajan, “Engineering Mathematics, Tata McGraw Hill Education (India) Private Limited Chennai 2nd Edition Paperback – 1 January 2018.

2. M.K. Venkataraman, “Engineering Mathematics, The National Publishing Company, Madras, 2016.

3. Dr. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, Paperback – 1, 2019.

Web References

1. https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf
2. https://www.nrigroupindia.com/niist/wp-content/uploads/sites/6/2022/02/lab-manual-it406matlab.pdf
3. https://www.studocu.com/row/document/comsats-university-islamabad/signals-and-systems/lab-lab-manual/38332410

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	1	-	1	-	-	-	-	-	1	1	1	1
2	3	2	1	1	-	1	-	-	-	-	-	1	1	1	1
3	2	1	-	-	-	1	-	-	-	-	-	1	1	1	1
4	2	1	-	-	-	1	-	-	-	-	-	1	1	1	1
5	3	2	1	1	-	1	-	-	-	-	-	1	1	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Artificial Intelligence and Data Science**	Programme: **B.Tech**						
Semester	**III**	Course Category : **ES**			End Semester Exam Type:**LE**			
Course Code	**U23ADPC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in Python Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
(Common to All Branches)								
Prerequisite	NIL							

Course Outcome		**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1	Describe common Python functionality and features used for data science.	**K2**
	CO2	Query Data Frame structures for cleaning and processing.	**K2**
	CO3	Configure your programming environment	**K3**
	CO4	Experiment the concept using data visualization.	**K3**
	CO5	Analyze real time datasets,	**K3**

List of Exercises

1. Build a python program to implement Fibonacci series.
2. Build a python program to get a range of numbers from user and to separate even numbers and odd numbers respectively.
3. Build a function in Python to check duplicate letters. It must accept a string, i.e. a sentence. The function should return True if the sentence has any word with duplicate letters, else return False.
4. Build a program to perform arithmetic operations using lambda function.
5. Build a Python program that takes a list of numbers as input and returns a new list containing only the even numbers from the input list.
6. Build a python program to create a class called Car with attributes Company, model, and year. Implement a method that returns the age of the car in years.
7. Build a python program to create a base class called Shape that has a method called area which returns the area of the shape (set it to 0 for now). Then, create two derived classes Rectangle and Circle that inherit from the Shape class to calculate the area of derived classes.
8. Build a python program to implement aggregation using Numpy.
9. Build a python program to perform Indexing and Sorting.
10. Build a python program to perform Handling of missing data.
11. Build a python program to perform usage of Pivot table using Titanic datasets
12. Build a python program to perform use of eval () and query ()
13. Build a python program to perform Scatter Plot
14. Build a python program to perform 3D plotting
15. Implement an application to process a real time data.

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Chirag Shah, “A Hands-On Introduction to Data Science”, Cambridge University Press, 2020.
2. Siddhartha Chatterjee, Michal Krystyanczuk, “Python Social Media Analytics”, Packt Publishing, 2017.
3. Jake VanderPlas, “Python Data Science Handbook - Essential Tools for Working with Data”, O’Reily Media Inc, 2016.
4. Zhang.Y, “An Introduction to Python and Computer Programming”, Springer Publications, 2016.
5. Wesley J Chun, “Core Python Programming”, Pearson Education, 2nd Edition, 2006.

Web References

1. https://nptel.ac.in/courses/106/106/106106212/
2. https://www.geeksforgeeks.org/data-analysis-visualization-python/
3. https://www.coursera.org/learn/python-data-analysis
4. https://www.python.org/
5. https://www.programiz.com/python-programming

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	1	3	-	-	-	-	-	-	-	2	2	2
2	2	3	2	2	3	-	-	-	-	-	-	-	2	3	2
3	3	3	3	2	3	-	-	-	-	-	-	-	3	3	3
4	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
5	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23CEP303**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Fluid Mechanics and Machines Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

Prerequisite	Basics of Civil and Mechanical Engineering	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Students will be able to measure the discharge through the channels and pipes	K3
	CO2 Students will have a basic knowledge and able to calculate the different losses in pipes	K2
	CO3 Students will have confidence in calculating the forces on vanes.	K2
	CO4 To estimate performance parameters of a given Centrifugal and Reciprocating pump	K3
	CO5 To select and analyze an appropriate turbine with reference to given situation in power plants.	K3

List of Experiments:

A. FLUID FLOW LABORATORY

1. Determination of co-efficient of discharge of venturimeter
2. Determination of co-efficient of discharge of Orifice meter.
3. Determination of co-efficient of discharge of Orifice.
4. Determination of co-efficient of discharge of Notches.
5. Determination of frictional losses in pipes.
6. Determination of Minor losses in pipes
7. Study of the impact of jet on vanes.

B. FLUID MACHINERY LABORATORY

1. Study of performance characteristics of centrifugal pump
2. Study of performance characteristics of Reciprocating pump
3. Tests on Turbine

Lecture Periods: 0	**Tutorial Periods:** 0	**Practical Periods:** 3 0	**Total Periods:** 30

Reference Books

1. Sarbjit Singh. "Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009.
2. John A. Roberson, "Hydraulic Engineering", John Wiley &Sons, Incorporated, 2013.
3. Streeter, Victor, L. and Wylie, Benjamin E. "Fluid Mechanics", McGraw-Hill Ltd. 2010

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1. https://archive.nptel.ac.in/courses/112/103/112103263/
2. https://archive.nptel.ac.in/courses/124/105/124105013/
3. https://archive.nptel.ac.in/courses/105/106/105106197/
4. https://web.uettaxila.edu.pk/CMS/AUT2013/ieWPbs/notes/Workshop%20Practice%20(Fitting%20Shop).pdf
5. https://www.govinfo.gov/content/pkg/GOVPUB-C13-f181dc241045a63f3355422ecf6a04eb/pdf/GOVPUB-C13-f181dc241045a63f3355422ecf6a04eb.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	1	2	1	1	1	-	1	1	-	2	3	1	2
2	3	1	1	1	1	1	-	1	1	-	2	3	1	1
3	3	1	1	1	1	1	-	2	1	-	2	3	1	1
4	3	1	1	1	1	1	-	2	2	-	2	3	1	1
5	3	1	1	1	1	1	-	2	2	-	2	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**III**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23CEC3XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**CERTIFICATION COURSE - I**	**0**	**0**	**4**	**-**	**100**	**-**	**100**
Prerequisite	**-**							

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as “pass” on satisfactory completion. A letter grade “P” is awarded to declare pass.

(iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**		**Total Marks**
	Attendance	**MCQ Test**	
Marks	10	90	100

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: SEC			*End Semester Exam Type: **-**			
Course Code	**U23CES301**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**BASIC VASTHU**	**2**	**0**	**0**	**-**	**100**	**-**	**100**

UNIT-I	**Introduction to Vasthu Shastra**	**Periods: 06**

Overview of Vasthu Shastra- Ancient texts and scriptures (e.g. Manasara, Vishwakarma Prakash)-Role in building design and planning-

Cultural significance- Relationship with astrology and geography-Introduction to common Vasthu terms (e.g. Vasthu Dosh, Shubh Muhurat).

UNIT-II	**Fundamental Principles of Vasthu**	**Periods: 06**

Five Elements (Panchabhutas)- Earth, Water, Fire, Air, and Space-

Directions and their Significance-Importance of cardinal directions (North, South, East, West)-Auspicious and inauspicious directions-

Vasthu Purusha Mandala-Spatial Geometry and Design Shapes and forms (square, rectangular, circular) and their significance

UNIT-III	**Vasthu for Residential Buildings**	**Periods: 06**

Site Selection and Layout: Criteria for choosing a plot (topography, environment), Orientation and zoning

Room Placement and Design: Ideal placements for various rooms (bedrooms, kitchens, bathrooms),

Ventilation and Lighting: Importance of natural light and airflow, design tips for maximizing natural resources.

UNIT-IV	**Vasthu for Commercial Buildings**	**Periods: 06**

Office Layout and Design: Principles for efficient workspace, Placement of desks and meeting rooms,

Retail Spaces: Designing for customer flow and engagement.

UNIT-V	**Impact of Vasthu on Business Success**	**Periods: 06**

Case studies of successful Vasthu-compliant businesses Understanding the psychological impact of Vasthu on employees and customers,

Hospitality Sector: Vasthu considerations for hotels and restaurants.

Lecture Periods: 30	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 30**

Evaluation Method

Assessment	**Internal Assessment Marks (CAM)**			**Total Marks**
	Attendance	**Report**	**Presentation/Demo/Skil Test**	
Marks	10	40	50	100

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: SEC			*End Semester Exam Type: **-**			
Course Code	U23CES402	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Plane Table Surveying**	**2**	**0**	**0**	**-**	**100**	**-**	**100**

UNIT-I	Introduction to Plane Table Surveying	**Periods: 06**

Definition and Scope of Plane Table Surveying,Comparison with Other Surveying Methods,Principle and Applications of Plane Table Surveying,Overview of Tools and Accessories: Plane Table, Alidade, Spirit Level, Plumbing Fork, and Compass,Advantages and Limitations

UNIT-II	**Methods of Plane Table Surveying**	**Periods: 06**

Radiation Method: Procedure, Applications, and Examples,Intersection Method: Theory, Field Procedure, and Plotting Techniques,Traversing Method: Sequential Station Plotting and Accuracy Considerations,Resection Method: Two-point and Three-point Problems

UNIT-III	**Field Procedures and Adjustments**	**Periods: 06**

Setting Up and Leveling the Plane Table,Orientation Methods: Magnetic Needle and Back Sighting,Centering Techniques Using Plumb Bob,Precautions and Common Errors in Field Observations,Types of Adjustments: Instrumental and Graphical.

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UNIT-IV	**Applications and Practical Exercises**	**Periods: 06**

Contour Mapping Using Plane Table Surveying,Mapping of Small and Medium Areas,Layout Planning for Civil Engineering Projects,Recording Details for Land and Property Surveys,Practical Problems and Exercises for Fieldwork

UNIT-V	**Advancements and Case Studies**	**Periods: 06**

Integration of Plane Table Surveying with Modern Techniques (e.g. GPS, Total Station),Comparison of Accuracy: Manual vs. Digital Techniques, Case Studies: Real-life Applications in Land Surveying and Construction, Challenges in Remote and Difficult Terrain Surveys, Future Prospects of Manual Surveying Techniques.

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Evaluation Method

Assessment	**Internal Assessment Marks (CAM)**			**Total Marks**
	Attendance	**Report**	**Presentation/Demo/Skil Test**	
Marks	10	40	50	100

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category Code: SEC			*End Semester Exam Type: **-**			
Course Code	U23CES302	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Auto Level Surveying**	**2**	**0**	**0**	**-**	**100**	**-**	**100**

UNIT-I	**Introduction to Auto Level Surveying**	**Periods: 06**

Overview and Importance of Auto Level Surveying,Basic Principle and Operation of Auto Level Instruments Types of Leveling Instruments: Dumpy Level vs. Auto Level,Components of an Auto Level: Telescope, Compensator, and Tripod,Advantages and Limitations of Auto Level Surveying.

UNIT-II	**Instrument Setup and Adjustment**	**Periods: 06**

Proper Setup and Mounting of Auto Level on Tripod,Leveling the Auto Level: Procedures and Techniques,Using the Plumb Bob for Accurate Instrument Centering,Adjusting for Optical and Mechanical Errors,Techniques for Ensuring Stability and Precision

UNIT-III	**Field Procedures for Auto Level Surveying**	**Periods: 06**

Reading and Interpreting Leveling Staff,Taking Readings: Back Sight, Foresight, and Intermediate Sight,Methods for Measuring Elevations and Height Differences,Procedures for Profile Leveling and Differential Leveling,Field Notations and Recording Measurements..

UNIT-IV	**Data Processing and Calculation Techniques**	**Periods: 06**

Calculating Height Differences Using Staff Readings,Use of Mean Values and Error Estimation,Application of Benchmarks and Datum Points in Surveys,Error Detection and Correction in Auto Leveling,Calculation of Reduced Levels and Cross-Sectional Profiles.

UNIT-V	**Applications and Practical Use of Auto Leveling**	**Periods: 06**

Applications in Construction: Foundation, Site Preparation, and Road Design,Applications in Land Surveying and Property Boundaries,Use of Auto Level for Contour Mapping and Drainage Design,Case Studies: Surveying for Infrastructure Projects (Roads, Railways, Canals),Challenges and Limitations in Auto Level Surveying and Best Practices.

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Evaluation Method

Assessment	**Internal Assessment Marks (CAM)**			**Total Marks**
	Attendance	**Report**	**Presentation/Demo/Skil Test**	
Marks	10	40	50	100

Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**III**			Course Category Code: **MC**			*End Semester Exam Type: **-**	
Course Code	**U23CEM303**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Climate Change**			**2**	**0**	**0**	**-**	**100**	**-**	**100**
Prerequisite	**-**									
Course Outcome	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)		
	CO1	Inspect the characteristics and temperature profile of the atmosphere						**K2**		
	CO2	Analyze past climate, human influence on global warming, and predict future climates						**K3**		
	CO3	Analyze the impact of climate change and the risk of Irreversible changes						**K3**		
	CO4	Outline the carbon credits and evidences of changes in Environment						**K2**		
	CO5	Acquire knowledge on clean development mechanism and mitigation technologies						**K2**		
UNIT-I	**ATMOSPHERE AND ITS COMPONENTS**						**Periods: 06**			
Importance of Atmosphere - Physical Chemical Characteristics of Atmosphere - Vertical structure of the atmosphere - Composition of the atmosphere-Atmospheric stability -Temperature profile of the atmosphere - Lapse rates - Temperature inversion-effects of inversion on pollution dispersion.										**CO1**
UNIT-II	**GLOBAL CLIMATE**						**Periods: 06**			
Account of past climate - Environmental indicators and instrumental records - Human Footprints on global warming- Predicting future climates- Temperature regime - Extreme climate events										**CO2**
UNIT-III	**IMPACTS OF CLIMATE CHANGE**						**Periods: 06**			
Causes of Climate change : Change of Temperature in the environment-Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors - Agriculture, Forestry and Ecosystem - Water Resources - Human Health - Industry, Settlement and Society - Methods and Scenarios - Projected Impacts for Different Regions- Uncertainties in the Projected Impacts of Climate Change - Risk of Irreversible Changes										**CO3**
UNIT-IV	**OBSERVED CHANGES AND ITS CAUSES**						**Periods: 06**			
Climate change and Carbon credits- Initiatives in India-Kyoto Protocol-Intergovernmental Panel on Climate change-Climate Sensitivity and Feedbacks -The Montreal Protocol - UNFCCC - IPCC -Evidences of Changes in Climate and Environment - on a Global Scale and in India										**CO4**
UNIT-V	**CLIMATE CHANGE AND MITIGATION MEASURES**						**Periods: 06**			
Clean Development Mechanism -Carbon Trading- examples of future Clean Technology - Biodiesel -Natural Compost - Eco- Friendly Plastic - Alternate Energy - Hydrogen - Bio-fuels —Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices-Carbon sequestration - Carbon capture and storage (CCS) - International and Regional cooperation- Remedial measures										**CO5**
Lecture Periods: 30	**Tutorial Periods:**			**Practical Periods: -**			**Total Periods: 30**			

Text Books

1. Joan Fitzgerald "Greenovation: Urban Leadership on Climate Change, Oxford University Press 2020.
2. Andrew Dessler and Edward A. Parson "The Science and Politics of Global Climate Change" 2009
3. J. David Neelin" Climate change and climate modelling" Cambridge University press (2011).
4. Robin Moilveen "Fundamentals of weather and climate" Oxford University Press (2nd Edition) (2010),
5. S. Dash Sushil Kumar, "Climate Change - An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007

Reference Books

1. Bill McKibben(2012), The Global Warming Reader: A Century of Writing About Climate Change, Penguin.
2. Jason Smerdon(2009) Climate Change: The Science of Global Warming and Our Energy Future, Columbia University
3. Adaptation (2006) and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press,ambridge.
4. J.M. Wallace and P.V. Hobbs (2006) Atmospheric Science, Elsevier / Academic Press.
5. Jan C. Van Dam,(2003) Impacts of "Climate Change and Climate Variability on Hydrological Regimes", Cambridge University press.

Web References
1. lutos://nntelac.in/courses/105102089/
2. httos://wonv.warmheartworldwide
3. huns://noteLac.inkontent/storage

Evaluation Method

Assessment	**Continuous Assessment Marks (CAM)**			**Total Marks**
	Attendance	**MCQ Test**	**Presentation / Activity / Assignment**	
Marks	10	30	60	100

IV SEMESTER SYLLABUS

Department	**Mathematics**			Programme :**B.Tech.**				
Semester	**IV**			Course Category Code: **BS**			*End Semester Exam Type: **TE**	
Course Code	**U23MATC04**			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	**NUMERICAL METHODS AND OPTIMIZATION**			**3**	**1**	**0**	**4**	**25**	**75**	**100**
(Common to EEE, ECE, ICE, BME, MECH, CIVIL & MECHATRONICS)										
Prerequisite	Basic Mathematics									
Course Outcome	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)		
	CO1	Solve Algebraic and Transcendental equations						**K2**		
	CO2	Solve Simultaneous Equations by various Numerical Techniques.						**K3**		
	CO3	Apply the Numerical Techniques of interpolation in various Intervals.						**K3**		
	CO4	Solve Linear programming problems by using Optimization Techniques.						**K3**		
	CO5	Find the solution of Transportation and Assignment Problems.						**K3**		
UNIT – I	**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS**						**Periods:12**			
Solution of Algebraic and Transcendental equations – Bisection method - Method of False position – Newton Raphson method (single only) – Eigen value and Eigen vector by Power method.										**CO1**
UNIT – II	**LINEAR SYSTEM OF EQUATIONS**						**Periods:12**			
Solutions of Linear system of equations and Matrix Inversion – Gauss Elimination and Gauss - Jordan methods. Iterative methods – Gauss Jacobi – Gauss Seidel.										**CO2**
UNIT – III	**INTERPOLATION AND SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**						**Periods:12**			
Interpolation by Newton's Forward and Backward Difference formula for equal intervals – Lagrange's method for unequal intervals. Integration by Trapezoidal and Simpson's rules (Single integration only). Fourth order Runge-Kutta method for solving first order Differential Equations.										**CO3**
UNIT – IV	**LINEAR PROGRAMMING PROBLEMS**						**Periods:12**			
Linear Programming Problems – Graphical Method – Simplex Method: Big M method – Two phase method.										**CO4**
UNIT – V	**TRANSPORTATION AND ASSIGNMENT PROBLEMS**						**Periods:12**			
Transportation Problems – Initial basic feasible solution using North-West Corner rule, Least Cost Method, Vogel's Approximation Method – Optimality in Transportation Problem by Modified Distribution (MODI) Method. Assignment Problems – Solutions of Assignment Problems by Hungarian Method – Unbalanced Assignment Problems.										**CO5**
Lecture Periods:45		**Tutorial Periods:15**		**Practical Periods:-**			**Total Periods:60**			

Text Books

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, "Numerical Methods", S. Chand Limited, 2008.
2. R. Panneerselvam "Operations Research" Prentice Hall of India, 2nd Edition,2004.
3. P.K. Gupta, D.S. Hira, "Operations Research", S. Chand, 5th Edition, 2018.

Reference Books

1. AtulGoyal, Madhuchanda Rakshit Suchet Kumar, "Numerical Methods", New India publishing Agency, 1st Edition, 2019.
2. Rajesh Kumar Gupta, "Numerical Methods - Fundamental and Applications", Cambridge University Press, 1st Edition, 2019.
3. S.Kalavathy, "Operation Research" ,Vikas Publishing house,4th Edition,2012.
4. Kevin J. Hastings, "Introduction to the Mathematics of Operations Research with Mathematica", Taylor and Francis, 2nd Edition, 2019.
5. T. Veerarajan, "Operations Research", McGraw Hill, 1st Edition, 2018.

Web References
1. https://nptel.ac.in/courses/111106101/
2. https://www.geektonight.com/operation-research-notes-pdf/#.XrXzoP8za00
3. https://freecomputerbooks.com/Numerical-Methods-with-Applications.html
4. https://www.pphmj.com/journals/IJNMA.htm
5. https://nptel.ac.in/courses/106/108/106108056/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	1	-	1	-	-	-	-	-	1	1	1	1
2	3	3	3	2	-	1	-	-	-	-	-	1	1	1	1
3	3	3	3	2	-	1	-	-	-	-	-	1	1	1	1
4	3	3	3	2	1	1	1	-	-	-	1	1	1	1	1
5	3	3	3	2	1	1	1	-	-	-	1	1	1	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computer Science and Engineering**	Programme: B.Tech						
Semester	**IV**	Course Category: **ES**			End Semester Exam Type: **TE**			
Course Code	**U23CSTC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Structures**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to All Branches except CSBS and FT)

Prerequisite	Any Programming Knowledge

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Compute time and space complexity for given problems	**K2**
	CO2 Demonstrate stack, queue and its operation.	**K2**
	CO3 Illustrate the various operations of linked list.	**K3**
	CO4 Use the concepts of tree for various applications.	**K3**
	CO5 Outline the various Tables, Graphs and Sets techniques.	**K3**

UNIT - I	**Basic Terminologies of Data Structures**	**Periods:09**	
Introduction: Basic Terminologies — Asymptotic Notations: Complexity analysis. Array and its operations - Searching: Linear Search and Binary Search Techniques. Sorting: Bubble Sort — Selection Sort — Insertion Sort — Heap Sort — Shell Sort. Performance and Comparison among the sorting methods.			**CO 1**

UNIT - II	**Stack and Queue Operations**	**Periods:09**	
Stacks and Queues: ADT Stack and its operations. Applications of Stacks: Expression Conversion and evaluation. ADT Queue and its operations. Types of Queue: Simple Queue — Circular Queue — Priority Queue — Deque.			**CO 2**

UNIT - III	**Linked List Operations**	**Periods:09**	
Linked Lists: Singly linked list: Representation in memory. Algorithms of several operations: Traversing – Searching – Insertion – Deletion. Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.			**CO 3**

UNIT - IV	**Trees**	**Periods:09**	
Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree – Threaded Binary Tree – Binary Search Tree – Binary Tree Traversals – AVL Tree- Red Black Tree.			**CO 4**

UNIT - V	**Graphs, Tables and Sets**	**Periods:09**	
Graph: Basic Terminologies and Representations – Graph traversal algorithms. Tables: Different types of tables – Hash Table and its operations - Applications. Sets: Representation of Sets- Operations and its applications.			**CO 5**

Lecture Periods:45	**Tutorial Periods:**	**Practical Periods:-**	**Total Periods:45**

Text Books

1. Ellis Horowitz, Sartaj Sahni," Fundamentals of Data Structures", Illustrated Edition, Computer Science Press, 2018.
2. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.
3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009.

Reference Books

1. D. Samanta, "Classic Data Structures", Prentice-Hall of India, Second Edition, 2012.
2. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program Design in c" . Prentice-Hall of India, Second Edition, 2007.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, Second. Edition,2006.
4. Mark Allen Weiss," Algorithms, Data Structures and Problem Solving with C++", Illustrated Edition, Addison-Wesley Publishing Company, 1995.
5. Mark Allen Weiss," Algorithms, Data Structures and Problem Solving with C++", Addison- Wesley Publishing Company, Illustrated Edition, 1995.

Web References

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial/
3. https://www.studytonight.com/data-structures/
4. https://www.tutorialspoint.com/data_structures_algorithms/
5. https://www.w3schools.in/data-structures-tutorial/intro/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**		Programme: **B.Tech.**					
Semester	**IV**		Course Category Code: **PC**			End Semester Exam Type: **TE**		
Course Code	**U23CET406**		Periods/Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Soil Mechanics**		**2**	**1**	**0**	**3**	**25**	**75**	**100**
Prerequisite									
Course Outcome	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)	
	CO1	Classify the soil and assess the Engineering Properties, based on index properties						**K3**	
	CO2	Assess the soil hydraulics and geostatic stress						**K3**	
	CO3	Understand the compressibility of soil under consolidation and compaction						**K3**	
	CO4	Understand the concept shear strength of cohesive and cohensionless soil.						**K3**	
	CO5	Analyze the stability of slopes using different methods						**K3**	

UNIT – I	**IDENTIFICATION AND CLASSIFICATION OF SOILS**	**Periods:12**
Formation of soil - Basic definition and phase relationship - Index properties (Determination of moisture content, specific gravity and voids ratio , grain size analysis , Atterberg limits) - classification of soil- Bureau of Indian Standards classification system – Unified classification system - soil deposits in India.		**CO1**
UNIT – II	**PERMEABILITY AND SEEPAGE IN SOILS**	**Periods:12**
Soil hydraulics : Soil water – capillary - Permeability - field and laboratory test - one dimensional flow, Seepage through soils – two - dimensional flow, flow nets, uplift pressure, piping, capillarity, seepage force; Principle of geostatic stress - neutral and effective stress and quicksand condition.		**CO2**
UNIT – III	**CONSOLIDATION AND COMPACTION**	**Periods:12**
Compressibility : Terzaghi's one dimensional consolidation theory - consolidation process – Computation of rate of settlement. - √t and log t methods– e-log p relationship – laboratory test – pre consolidation pressure. Compaction – laboratory tests – field compaction. Stress distribution in homogeneous and isotropic medium – Boussinesq theory – (Point load, Line load and UDL) Use of New marks influence chart.		**CO3**
UNIT – IV	**SHEAR STRENGTH**	**Periods:12**
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 – Cyclic mobility – Liquefaction.		**CO4**
UNIT – V	**SLOPE STABILITY**	**Periods:12**
Introduction- slopes failure - stability of infinite slope – landslides-Finite slope analysis - Bishop's method - Swedish circle method – stability number-Slope stability – improving slope stability by reinforcement and confinement.		**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. Punmia B.C. "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 17th Edition, (2017).
2. Arora, K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
3. Murthy, V.N.S. "Text book of Soil Mechanics and Foundation engineering", CBS Publishers Distribution Ltd. New Delhi. 2014.
4. Purushothama Raj. P. "Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, India 2013.
5. Varghese, P.C."Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005

Reference Books

1. Venkatramaiah.C. "Geotechnical Engineering", New Age International Pvt. Ltd. New Delhi, 2017
2. Braja M Das, "Principles of Geotechnical Engineering", Cengage Learning India Private Limited, 8th Edition, 2014.
3. Modi P N, "Soil Mechanics and Foundation Engineering", Standard Book House, New Delhi, 2010.
4. Coduto, D.P. "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt. Ltd. New Delhi, 2010.

5. B. J. Kasmalkar" Foundation Engineering", Pune VidyarthiGrihaPrakashan, McGraw- Hill Book Company

Web References

1. https://nptel.ac.in/courses/105101201/
2. https://nptel.ac.in/courses/105103097/
3. http://ascelibrary.org/page/books/s-gsp.
4. http://nptel.ac.in/courses/105101084/
5. http://nptel.ac.in/courses/105106142/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	-	2	1	1	-	-	-	-	1	3	-	-
2	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
3	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
4	3	2	1	1	-	1	1	-	-	-	-	1	3	-	-
5	2	2	1	-	-	-	1	-	-	-	-	1	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CET407**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**DESIGN OF RC ELEMENTS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	Concrete Technology		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	To gain basic knowledge on design philosophy in WSM, ULM, LSM	**K3**
	CO2	To understand the design concepts in beam by LSM	**K3**
	CO3	To understand the design concepts in slab by LSM	**K3**
	CO4	To understand the basic design concepts in column by LSM	**K3**
	CO5	To gain knowledge on design of Footing and staircase by LSM	**K3**

UNIT – I	**BASICS OF STRUCTURAL DESIGN**	**Periods:09**	
Role of structural engineer in structural design – elements of structures – reinforced concrete – ductility versus brittleness – methods of design - advantages of limit state method over other methods - design codes and specification - Introduction to working stress method- Permissible stresses - Factor of Safety-modular ratio and cracking moment-IS 456 - limit state philosophy as detailed in current IS code.			**CO1**
UNIT – II	**LIMIT STATE DESIGN OF BEAMS**	**Periods:09**	
Introduction to flexural members – Behavior of RC beam under flexure - Design of singly reinforced, doubly reinforced and flanged sections. Design for bond, shear and torsion.			**CO2**
UNIT – III	**LIMIT STATE DESIGN OF SLABS**	**Periods:09**	
Introduction -Types of slabs- General design considerations- Design of one-way and two-way slabs. Design of continuous (one-way only) slabs- Design of flat slabs.			**CO3**
UNIT – IV	**LIMIT STATE DESIGN OF COLUMNS**	**Periods:09**	
Design of compression members – Effective length – Design short column under axial compression, axial compression and biaxial bending - Design of slender columns – Braced and un-braced slender column.			**CO4**
UNIT – V	**LIMIT STATE DESIGN OF FOOTING AND STAIRCASE**	**Periods:09**	
Design of Footings - Isolated footing with axial and eccentric loading- Combined Rectangular and Trapezoidal footing for two columns only, Design of Stair Case (ordinary and doglegged)			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Punmia, B.C and Jain, A.K, Limit state design of Reinforced Concrete, Lakshmi Publications (P) Ltd., New Delhi, First Edition, 2007

2. M.L Gambir, Design of Reinforced Concrete Structures, PHI Publications, 2008

3. Subramanian.N., Design of Reinforced Concrete Structures, Oxford University, New Delhi, 2013.

Reference Books

1. Sinha, S.N, Reinforced Concrete Design, 2nd Edition, Tata Mc-Graw-Hill Publishing Company Limited, New Delhi, 2002.

2. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, Tata McGraw Hill Publishing Company Ltd., New Delhi, Third edition, 2011

3. Shah V.L. and Karve, S.R, Advanced Reinforced Concrete Design, Structures Publications, Pune, 2002.

4. IS 456-2000 Plain and Reinforced Concrete – Code of Practice, Bureau of Indian Standards, New Delhi

5. IS 875- 1987 (Part 1), Code of Practice for Design Loads (Other than Earthquake) For Buildings and Structures, Bureau of Indian Standards, New Delhi.

Web References

1. https://www.youtube.com/watch?v=1_SXPr_YTOU
2. https://youtu.be/cZYQ75OgrNc
3. https://youtu.be/1vjca8BXkwE

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	1	-	2	1	1	-	-	-	1	3	-	-
2	3	2	1	1	-	1	1	-	-	-	1	3	-	-
3	3	2	1	1	-	1	1	-	-	-	1	3	-	-
4	3	2	1	1	-	1	1	-	-	-	1	3	-	-
5	2	2	1	-	-	1	1	-	-	-	1	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category : **BC**			End Semester Exam Type:**TE**			
Course Code	**U23CEB402**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Concrete Technology**	**2**	**0**	**2**	**3**	**50**	**50**	**100**
Prerequisite	**Basics of Civil Engineering**							

Course Outcomes			
	On completion of the course, the students will be able to		BT Mapping (Highest Level)
	CO1	Acquire knowledge on the testing of aggregates and its properties.	**K2**
	CO2	Understand the properties of concrete in fresh state	**K2**
	CO3	Comprehend the properties of concrete in hardened concrete	**K3**
	CO4	Acquire knowledge on the properties of cement and aggregate	**K2**
	CO5	Evaluate the workability of fresh Concrete and strength characteristics of hardened concrete	**K3**

UNIT- I	**Aggregate**	**Periods:10**	
Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size- Properties Recycled aggregate.			**CO1**
UNIT- II	**Fresh Concrete**	**Periods:10**	
Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing, vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.			**CO2**
UNIT- III	**Hardened Concrete**	**Periods:10**	
Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing.			**CO3**
UNIT- IV	**Tests on Cement, Aggregates and Mix design**	**Periods:15**	
List of Exercises 1. a) Setting time b) Compressive strength. 2. a) Water Absorption b) Impact Test c) Crushing Test 3. IS method of mix design of normal concrete as per IS: 10262			**CO4**
UNIT-V	**Test on Fresh and Hardened Concrete**	**Periods:15**	
List of Exercises 1. a) Slump cone test b) Compacting factor test 2. a) Compressive Test b) Flexural Strength Test			**CO5**

Lecture Periods:30	**Tutorial Periods:-**	**Practical Periods:30**	**Total Periods:60**

Text Books

1. M.S.Shetty, "Concrete Technology", S.Chand & Co. 8th Edition, 2019
2. Gambir M. L, Concrete Technology, Tata MC-Graw Hill-Education, 2013.
3. A.M.Neville, "Properties of Concrete"– Pearson Education Limited, 5th Edition, 2012

Reference Books

1. Zongjin Li, Advanced Concrete Technology, John Wiley & Sons – 2011
2. Metha P. K, "Concrete: Microstructure, properties and Materials", McGraw-Hill, 2014.
3. IS: 12269-1987, Specification for 53 grade ordinary Portland Cement, BIS, New Delhi.
4. IS: 383 – 1970, Specification for Coarse and fine natural sources for Concrete, BIS, New Delhi
5. IS: 10262-2009, Concrete Mix Proportioning - Guidelines

Web References

1. https://nptel.ac.in/courses/105/102/105102012/
2. https://nptel.ac.in/courses/105106176/
3. https://nptel.ac.in/courses/105/104/105104030/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	3	2	3	2	3	3	2	2
2	3	3	3	3	3	3	3	2	3	2	3	3	3	2
3	3	3	3	3	3	3	3	2	3	2	3	3	3	2
4	3	3	3	3	3	3	3	2	3	2	3	3	3	2
5	3	3	3	3	3	3	3	2	3	2	3	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Theory						
Assessment	Continuous Assessment Marks (CAM)				End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Attendance		
Marks	5	5	5	5	75	60
	20(to be weighted for 10 marks)				(to be weighted for 50 marks)	

Department	**English**	Programme: **B.Tech.**					
Semester	**IV**	Course Category Code: **HS**			*End Semester Exam Type: **LE**		
Course Code	**U23ENPC02**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**General Proficiency- II**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to ALL Branches except CSBS)

Prerequisite	Basics of English Language	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Infer ideas to attend international standardized test by broadening receptive and productive skills	**K2**
	CO2 Interpret the types of writing in different state of affairs	**K3**
	CO3 Acquire meticulous exposure in speaking and get rid of performance anxiety	**K2**
	CO4 Articulate the ideas and opinions effectively and coherently	**K2**
	CO5 Progress the skills to compete in various competitive exams like GATE, GRE, UPSC, etc.	**K4**

UNIT- I	**CAREER SKILLS**	**Periods:6**
Listening: Listening at specific contexts - Speaking: Demonstrative speaking practice using visual aids (charts, graphs, maps) - Reading: Read and Review -Newspaper, Advertisement, Company Handbooks, and Guidelines (IELTS based) - Writing: Integrated Writing Task (TOEFL) - Vocabulary: Synonyms and Antonyms (IELTS)		**CO1**
UNIT- II	**CORPORATE SKILLS**	**Periods:6**
Listening: Listening English news and reproducing in own words - Speaking: Team Presentation - Reading: Short texts and Longer Passages (cloze reading) - Writing: Analytical Writing: Analyzing an issue and Argument task (GRE based) - Vocabulary: Prefix and Suffix		**CO2**
UNIT- III	**FUNCTIONAL SKILLS**	**Periods:6**
Listening: Listening TED Talks - Speaking: Brainstorming & Individual Presentation - Reading: Text Completion (GRE Based) - Writing: Picture Inference - Vocabulary: Word Formation		**CO3**
UNIT- IV	**TRANSFERRABLE SKILLS**	**Periods:6**
Listening: Listening Documentaries and making notes - Speaking: Mock Interview - Reading: Read texts on emerging trends - Writing: Agreeing & Disagreeing Essay (IELTS) - Vocabulary: Euphemism, Redundancy, Clichés and Intensifiers		**CO4**
UNIT-V	**VERBAL APTITUDE - II**	**Periods:6**
Transformational Grammar: Tenses, Change of Voice, Concord **Verbal Ability Enhancement:** Letter Series, Coding &Decoding, Sentence Equivalence (GRE)Analytical Reasoning and Logical Reasoning (GATE), Syllogism, One-word Substitution, Jumbled Sentences		**CO5**

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Cullen, Pauline, Amanda French, and Vanessa Jakeman**.** "The official Cambridge guide to IELTS for academic & general training".Cambridge, 2014.
2. Prasad, Hari Mohan, Sinha, Uma Rani, "Objective English for Competitive Examinations", Tata Mc Graw Hill: Noida,2010.
3. Lougheed, Lin. "Barron's Writing for the TOEFL IBT: With Audio CD". Barron's Educational series, 2008.
4. Grussendorf, Marion, "English for Presentations", Oxford University Press, Oxford, 2007.
5. Murphy, Raymond English Grammar in Use with answers: Reference and Practice for Intermediate students, Cambridge: CUP,2004.

Web References

1.https://www.englishclub.com/grammar/nouns-compound.htm
2.https://lofoya.com/Verbal-Test-Questions-and-Answers/Sentence-Completion/l3p1
3.https://www.grammarwiz.com/phrases-and-clauses-quiz.html
4.https://www.clarkandmiller.com/25-english-euphemisms-for-delicate-situations/
5.http://www.englishvocabularyexercises.com/general-vocabulary/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
2	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
3	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
4	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1
5	1	-	-	-	-	-	-	1	-	3	-	2	1	1	1

Correlation Level: 1-Low, 2-Medium, 3-High

Evaluation Methods

Practical				
Continuous Assessment Internal Evaluation		**End Semester External Evaluation**		**Total Marks**
50 marks		**50 marks**		100
Conduction of Practical (Assignment 1&2 -10 Marks Performance in practical classes - 5 Marks)	15	Listening (L)	20	
Record	5	Speaking(S)	10	
Viva	5	Reading(R)	10	
Model Practical Examination (Model Exam is conducted for 50 Marks that will be converted to 15 Marks)	15	Writing(W)	10	
Attendance	10			

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: **ES**			*End Semester Exam Type: **LE**			
Course Code	**U23CSPC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Structures Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to all Branches Except CSBS and FT)

Prerequisite	Basic Programming Knowledge		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Analyse the algorithm's / program's efficiency in terms of time and space complexity.	**K3**
	CO2	Solve the given problem by identifying the appropriate Data Structure.	**K3**
	CO3	Solve the problems of searching and sorting techniques.	**K3**
	CO4	Solve problems in linear Data Structures.	**K4**
	CO5	Solve problems in non-linear Data Structures.	**K4**

List of Exercises:

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list. a) Delete an element from list b) Search for a key element in list c) count number of nodes in list.
5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.
6. Write a C program to implement the dequeue (double ended queue) ADT using a doubly linked list and an array.
7. Write a C program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.
8. Write a C program that use recursive functions to traverse the given binary tree in
   a) Preorder b) Inorder c) Postorder.
9. Write a C program to perform the AVL tree operations.
10. Write a C program to implement Graph Traversal Techniques.
11. Write a C program to implement the Set operations.
    a) Union b) Intersection c) Difference.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Yashavant Kanetkar, "Data Structures through C", BPB Publications, 3rd Edition, 2019.
2. Tenebaum Aaron M, "Data Structures using C', Pearson Publisher, 1st Edition, 2019.
3. Manjunath Aradhya M and Srinivas Subramiam, "C Programming and Data Structures", Cengage India 1st Edition, 2017.
4. Reema Thareja, "Data structures using C", Oxford University, 2nd Edition, 2014. 5.Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st Edition, 2013.

Web References

1. https://www.tutorialspoint.com/data_structures_algorithms/
2. https://www.w3schools.in/data-structures-tutorial/intro/
3. https://nptel.ac.in/courses/106103069/
4. https://swayam.gov.in/nd1_noc20_cs70/preview
5. https://nptel.ac.in/courses/106103069

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**	Programme: **B.Tech.**					
Semester	**IV**	Course Category Code: **PC**			*End Semester Exam Type: **LE**		
Course Code	**U23CEP404**	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Geotechnical Engineering Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

Prerequisite	Basics of Civil and Mechanical Engineering	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Classify the soil and assess the engineering Properties, based on index properties	K3
	CO2 Understand the concept of insuit density and compaction characteristic of soil sample	K2
	CO3 Understand about the techniques and method to determine the index properties and Engineering properties of soil sample	K2
	CO4 Understand about the techniques and method to determine the Engineering properties of soil sample	K3
	CO5 Understand the concept and method to determine the penetration value N of the soil	K3

List of Experiments:

DETERMINATION OF INDEX PROPERTIES

1. Determination of Grain size distribution (Sieve Analysis, Hydrometer Analysis)
2. Determination of Specific gravity of soil grains (Pycnometer, Density bottle)
3. Determination of Atterberg limits Test
   -Liquid limit,
   -Plastic limit
   -shrinkage limit Test
4. Determination of swell index Test

DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS

5. Determination of Field density test (Core cutter and sand replacement methods)
6. Determination of moisture - Density relationship using Standard Proctor Test

DETERMINATION OF ENGINEERING PROPERTIES

7. Determination of Permeability (Constant Head, Falling Head methods)
8. Determination of Direct shear test on Cohesion less soil
9. Determination of Unconfined compression test on cohesive soil
10. Determination of Triaxial compression test on cohesive soil
11. Demonstration of one dimensional consolidation Test
12. Demonstration of Standard Penetration Test (SPT)

Lecture Periods: 0	**Tutorial Periods:** 0	**Practical Periods:** 3 0	**Total Periods:** 30

Reference Books

1. Arora K.R 'Soil Mechanics and Foundation Engineering' Standard Publishers PVt.Ltd, 7TH Edition,(2019).
2. Punmia B.C. "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 17th Edition, (2017).
3. Santosh kumar Garg 'Soil Mechanics and Foundation Engineering (In S.I. Units),Khanna Publishers,(2014).
4. "Soil Engineering Laboratory Instruction Manual" published by Engineering College Cooperative Society, Anna University, Chennai, 2010.
5. Indian Standards on Soil Engineering, Part 1 Laboratory Testing of Soils for Civil Engineering Purposes —SP 3 (Part 1): 1987‖, Bureau of Indian Standards, New Delhi, 1987.

Web References

1. https://nptel.ac.in/courses/105103
2. https://nptel.ac.in/courses/105/101/105101083/
3. https://nptel.ac.in/courses/105105176/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	1	2	1	1	1	-	1	1	-	2	3	1	2
2	3	1	1	1	1	1	-	1	1	-	2	3	1	1
3	3	1	1	1	1	1	-	2	1	-	2	3	1	1
4	3	1	1	1	1	1	-	2	2	-	2	3	1	1
5	3	1	1	1	1	1	-	2	2	-	2	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**IV**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23CEC4XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**CERTIFICATION COURSE - IV**	**0**	**0**	**4**	**-**	**100**	**-**	**100**
Prerequisite	**-**							

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as “pass” on satisfactory completion. A letter grade “P” is awarded to declare pass.

(iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**		**Total Marks**
	Attendance	**MCQ Test**	
Marks	10	90	100

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: SEC			*End Semester Exam Type: **-**			
Course Code	U23CES402	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**MS Office – Word, Excel, Power Point**	**2**	**0**	**0**	**-**	**100**	**-**	**100**

UNIT-I	Introduction to MS Office and Word Processing	**Periods: 06**

Overview of MS Office Suite: Applications and features. Getting Started with MS Word: Interface, navigation, and basic tools, Document Creation: Formatting text, paragraphs, and pages. Styles and Templates: Applying and customizing templates for professional documents. Advanced Features: Mail merge, hyperlinks, bookmarks, and table of contents.

UNIT-II	**Advanced MS Word Features**	**Periods: 06**

Tables and Charts: Creating and formatting tables, embedding charts. Collaboration Tools: Track changes, comments, and sharing options. Document Protection: Password protection, editing restrictions. Printing and Exporting: Print setup, exporting as PDF, and file compatibility.

UNIT-III	**Introduction to MS Excel and Data Management**	**Periods: 06**

MS Excel Basics: Interface, navigation, and workbook structure. Data Entry and Formatting: Working with cells, rows, columns, and ranges. Formulas and Functions: Basic arithmetic, logical functions (IF, SUM, AVERAGE). Sorting and Filtering Data: Techniques for organizing large datasets.

UNIT-IV	**Advanced Excel and Data Visualization**	**Periods: 06**

Charts and Graphs: Creating bar, line, pie charts, and sparklines. Pivot Tables and Pivot Charts: Summarizing and analyzing data. Conditional Formatting: Highlighting data trends and patterns. Data Validation and Protection: Creating drop-down lists and securing data. Macros: Introduction to automation using macros.

UNIT-V	**MS PowerPoint – Creating Professional Presentations**	**Periods: 06**

Basics of MS PowerPoint: Interface, slide layouts, and themes. Content Creation: Adding text, images, tables, and charts, Transitions and Animations: Applying effects to slides and objects. Presentation Tools: Slide show settings, speaker notes, and rehearsal. Tips for Effective Presentations: Design principles, consistency, and engagement.

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Evaluation Method

Assessment	**Internal Assessment Marks (CAM)**			**Total Marks**
	Attendance	**Report**	**Presentation/Demo/Skil Test**	
Marks	10	40	50	100

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: SEC			*End Semester Exam Type: **-**			
Course Code	U23CES402	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Measurements and Conversion**	**2**	**0**	**0**	**-**	**100**	**-**	**100**

UNIT-I	**Fundamentals of Measurements**	**Periods: 06**

Introduction to Measurements: Importance, principles, and types of measurements,Units of Measurement: SI units, Imperial units, and conversions,Accuracy and Precision: Definitions, significance, and factors affecting measurements,Measuring Instruments: Overview of scales, calipers, micrometers, and digital tools.

UNIT-II	**Linear and Angular Measurements**	**Periods: 06**

Linear Measurements: Tools (rulers, tapes, Vernier calipers), techniques, and errors,Angular Measurements: Tools (protractors, theodolites), uses, and precision techniques,Applications in Engineering: Length, area, and volume measurements in construction and manufacturing,Practical Challenges: Measuring irregular surfaces and large distances.

UNIT-III	**Mass, Weight, and Volume Measurements**	**Periods: 06**

Mass vs. Weight: Concepts and measuring tools (balances and load cells),Volume Measurement: Techniques for regular and irregular objects, using displacement and formulas,Density and Specific Gravity: Calculations and applications in engineering and science,Practical Applications: Measurements in liquids, gases, and bulk materials

UNIT-IV	**Measurement Systems and Conversion Techniques**	**Periods: 06**

Measurement Systems: SI, CGS, FPS, and MKS systems,Unit Conversion: Conversion of length, area, volume, weight, temperature, and pressure,Dimensional Analysis: Application in formula validation and unit consistency.

Real-World Applications: Currency exchange rates, scaling in maps and blueprints.

UNIT-V	**Measurement Errors and Standards**	**Periods: 06**

Types of Errors: Systematic, random, and gross errors,Error Reduction Techniques: Calibration, proper handling, and repeatability,Standardization in Measurements: International and national standards (ISO, BIS).

Future Trends: Digital measurement tools, IoT-enabled sensors, and automation in measurements.

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Evaluation Method

Assessment	**Internal Assessment Marks (CAM)**			**Total Marks**
	Attendance	**Report**	**Presentation/Demo/Skil Test**	
Marks	10	40	50	100

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: SEC			*End Semester Exam Type: **-**			
Course Code	U23CES402	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Traditional construction in modern age**	**2**	**0**	**0**	**-**	**100**	**-**	**100**

UNIT-I	Overview of Traditional Construction Methods	**Periods: 06**

Definition and Significance: Understanding traditional construction practices and their cultural importance, Materials Used: Mud, stone, wood, bamboo, lime, and other natural materials, Construction Techniques: Load-bearing walls, vaulted roofs, and timber framing, Case Studies: Historical examples of traditional architecture and their relevance today.

UNIT-II	**Integration of Traditional and Modern Techniques**	**Periods: 06**

Hybrid Construction Practices: Combining traditional materials with modern structural systems, Sustainability: Role of traditional methods in promoting eco-friendly construction, Adaptation for Modern Needs: Insulating traditional buildings, integrating utilities, and enhancing durability, Challenges: Preserving authenticity while meeting modern codes and standards.

UNIT-III	**Role of Traditional Materials in Modern Construction**	**Periods: 06**

Earth-Based Materials: Cob, adobe, and rammed earth in contemporary architecture, Bamboo and Timber: Applications in structural and decorative elements, Stone and Masonry: Reviving techniques for modern durability and aesthetics, Recycled and Locally Sourced Materials: Using traditional ideas to enhance sustainability.

UNIT-IV	**Preservation and Revitalization**	**Periods: 06**

Conservation Techniques: Restoring and maintaining traditional buildings,Heritage Structures: Adapting old buildings for new uses (adaptive reuse),Policy and Legislation: Guidelines for conserving architectural heritage. Community Involvement: Role of local communities in preserving traditional construction practices

UNIT-V	**Innovations Inspired by Traditional Methods**	**Periods: 06**

Modern Applications of Vernacular Architecture: Climate-responsive designs and passive cooling techniques, Technological Advancements: Prefabrication and modular construction using traditional materials, Smart and Sustainable Cities: Incorporating traditional practices in urban planning, Future Trends: Resurgence of traditional techniques to meet global sustainability goals

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Evaluation Method

Assessment	**Internal Assessment Marks (CAM)**			**Total Marks**
	Attendance	**Report**	**Presentation/Demo/Skil Test**	
Marks	10	40	50	100

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: MC			*End Semester Exam Type: **-**			
Course Code	U23CEM404	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Right to Information and Good Governance**	**2**	**0**	**0**	**-**	**100**	**-**	**100**

UNIT-I	**Introduction**	**Periods: 06**
Conceptual background — Right to know — Open Government — Transparency in governance and accountability — Right to information under the Indian Constitution - Article 19 (1Xa) and Article 21 of the Constitution — Role of NGOs and movement for right to information — Right to Information Act, 2005 — Scope and objectives.		
UNIT-II	**Obligation of Public Authorities**	**Periods: 06**
Obligations of public authorities: Section 4. Designation of Public Information Officers: Section 5 Disposal of request: Section 7. Exemption from disclosure of information: Section 8.Grounds for rejection to access in certain cases. Section 9.Severability: Section 10.Third party information: Section I1		
UNIT-III	**Central and State Information Commission**	**Periods: 06**
Constitution of Central and State Information Commissions, Terms of office and conditions of service, Removal of Chief Information Commissioner or Information Commissioner,Powers and functions of Information Commissions.		
UNIT-IV	**Judiciary and Right to Information Act**	**Periods: 06**
Protection of right to access the information — Role of the Supreme Court and High Courts —Recent attempts of dilution of the right to information Law		
UNIT-V	**Right to Information Act, 2005 and its relevance to other laws**	**Periods: 06**
Public Records Act, 1993.Whistle Blowers Protection Act, 2014.Official Secrets Act, 1923		

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Evaluation Method

Assessment	**Internal Assessment Marks (CAM)**			**Total Marks**
	Attendance	**Report**	**Presentation/Demo/Skil Test**	
Marks	10	40	50	100

Department	**Civil Engineering**			Programme : **B.Tech**				
Semester	**V**			Course Category Code:**HS**			*End Semester Exam Type: **TE**	
Course Code	**U23HSTC02**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM / ESE / TM
Course Name	**Research Methodology**			**2**	**-**	**-**	**2**	**25 / 75 / 100**
Prerequisite	**Nil**							
Course Outcomes	***On completion of the course, the students will be able to***							BT Mapping (Highest Level)
	CO1	Students will be able to explain the differences between various types of research and describe how different research methods are used to address engineering problems.						**K2**
	CO2	Students will develop the ability to identify research problems, perform comprehensive literature reviews, and use various tools and services for effective information retrieval.						**K2**
	CO3	Students will gain proficiency in designing experiments, analyzing data, and interpreting results using both numerical and graphical methods.						**K4**
	CO4	Students will be able to apply ethical guidelines to structure and write research papers and dissertations, avoiding plagiarism.						**K3**
	CO5	Students will understand the fundamentals of intellectual property rights, including how to protect and enforce them, which is crucial for innovation and entrepreneurship in engineering.						**K3**
UNIT-I	**Introduction to Research**						**Periods: 06**	
Meaning and Importance of Research, Types of Research: Overview of Basic, Applied, and Developmental Research, Overview of the Research Process, Defining a Research Problem: Key Considerations, Setting Research Objectives and Research Questions, Introduction to Research Design: Basic Concepts, Approaches to Research: Quantitative vs. Qualitative.								**CO1**
UNIT-II	**Problem Formulation and Literature Review**						**Periods: 06**	
Identifying and Formulating Research Problems, conducting a Literature Review: Essential Steps, Referencing and Citation Methods: Basic Techniques. Sources of Information: Overview of Libraries and Online Databases.								**CO2**
UNIT-III	**Research Methods and Data Analysis**						**Periods: 06**	
Introduction to Experimental Research, Developing Hypotheses: Basic Approach. Data Collection Methods:Sampling and Surveys, Basics of Data Analysis: Numerical and Graphical Analysis, Introduction to Inferential Statistics.								**CO3**
UNIT-IV	**Writing and Presenting Research**						**Periods: 06**	
Preparing a Research Report: Key Sections (Abstract, Introduction, Methodology, Results, Discussion, Conclusion). Referencing and Citation: Brief Overview.								**CO4**
UNIT-V	**Ethics and Legal aspects in research**						**Periods: 06**	
Ethical Considerations in Research: Introduction to Scientific Misconduct. Basics of Intellectual Property Rights - Introduction to Patents, Copyrights, and Trademarks – Case studies on ethical dilemmas in research.								**CO5**
Lecture Periods: 30	**Tutorial Periods:**			**Practical Periods:**			**Total Periods: 30**	

Text Books

1. Kumar, R. Research Methodology: A Step-by-Step Guide for Beginners, 5th Edition, SAGE Publications, 2019.
2. Ram Ahuja, (2022). Research methods (2nd ed.). Rawat Publications.
3. Creswell, J. W., and Creswell, J. D. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th Edition, SAGE Publications, 2018.
4. Kothari, C. R. (2023). Research methodology – Methods and Techniques (5th ed.). New Age International Publishers.
5. T. Ramappa (2008). Intellectual Property Rights under WTO, S. Chand Publishers

Reference Books

1. Thiel, D. V. (2014). Research methods for engineers. Cambridge University Press.
2. Ganesan, R. (2024). Research methodology for engineers. MJP Publishers.
3. Agarwal, C., & Sharma, V. (2012). Research methodology in sociology. Commonwealth Publishers.
4. Thody, A. (2006). Writing and presenting research (SAGE Study Skills Series). SAGE Publications.
5. Bordens, K. S. and Abbott, B. B.(2011), Research Design and Methods – A Process Approach (8th ed.). McGraw Hill.

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1. https://conjointly.com/kb/
2. https://owl.purdue.edu/owl/research_and_citation/conducting_research/writing_a_literature_review.html
3. https://files.eric.ed.gov/fulltext/ED536788.pdf
4. https://researcheracademy.elsevier.com/
5. https://www.wipo.int/
6. https://www.scholastic.com/parents/school-success/homework-help/homework-project-tips/7-steps-to-successful-research-report.html
7. https://www.futurelearn.com/info/courses/business-research-methods- investigation.
8. https://articles.manupatra.com/article-details/Patent-Types-Laws-related-to-them-in-India
9. https://researchgate.net/
10. https://journals.sagepub.com/home/jmx

COs/POs Mapping

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	1	1	1	1	1	3
CO2	2	3	2	2	2	1	1	1	2	2	1	3
CO3	3	3	3	3	2	1	1	1	1	1	2	2
CO4	2	2	1	2	1	1	1	3	2	3	1	2
CO5	2	2	2	2	1	2	2	3	2	2	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Internal Assessment Marks (IAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**V**			Course Category Code: **ES**		*End Semester Exam Type: **TE**		
Course Code	**U23ITTC02**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Programming in Java**			**3**	**0**	**0**	**3**	**25**	**75**	**100**
(Common to All Branches)										
Prerequisite	Basic knowledge of Object-Oriented Programming Principles									
Course Outcome	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)		
	CO1	Articulate the concept of Java fundamentals, OOPs and Strings						**K2**		
	CO2	Demonstrate the principles of inheritance, packages and interfaces with real time applications						**K2**		
	CO3	Create real time applications using exception handling and thread programming.						**K3**		
	CO4	Build distributed applications using Collections and IO streams						**K3**		
	CO5	Design and build simple GUI programs using AWT, Swings and build database applications						**K3**		

Unit- I	**Introduction**	**Periods: 09**
Introduction: Java: History – Features – JVM - JRE – JDK – Java Compilation and Execution – Data Types - Variables, Types, Expressions, Assignment Statements, Input/Output Statements: Scanner/System class, Type Casting (Primitives to Primitives), Conditional and Iterative Control Structures – Arrays. **OOPs with Java:** Introduction to OOPs Concepts - Class – Objects – Methods - Access Modifiers – Creating Class and Objects, Object Life-Cycle - Garbage Collection-Constructors - this – static – Array of Objects – Nested Classes. **String**: String Class– Built-in Methods – StringBuilder – String Buffer		**CO1**
Unit- II	**Inheritance, Interfaces and Packages**	**Periods: 09**
Inheritance: Types of Inheritance – is-a Relationship, has-a Relationship – super keyword – final keyword – Polymorphism - Method overloading and Method overriding – Abstract Class **Interfaces:** Define – Extend – Implement – Access - Interfaces vs Abstract classes, Type Conversions (Primitives to Objects vice-versa): Autoboxing and Auto unboxing **Packages:** Define – Create – Access – Import		**CO2**
Unit- III	**Exception Handling and Multithreading**	**Periods: 09**
Exception Handling: Exception Hierarchy – Checked and Unchecked Exceptions – try, catch, throws, throw and finally – User Defined Exceptions. **Multithreading:** Thread – Life cycle – Defining and Running – Implementation Types – Thread Priorities – Thread Synchronization - Inter-Thread Communication		**CO3**
Unit- IV	**Collections and I/O Streams**	**Periods: 09**
Collections: List: Array List and LinkedList. Set: HashSet and Tree Set. Map: HashMap – Stack – Queue. Lambda Expressions. **I/O Streams:** Streams – Byte Streams and Character Streams – File Input Stream and File Output Stream – File Reader and FileWriter. Object Serialization: Object Input Stream and Object Output Stream.		**CO4**
Unit- V	**GUI and JDBC**	**Periods: 09**
AWT: Components – Controls – Event Handling. **SWING**: Swing Components – Layout Management. **JDBC:** JDBC Architecture – JDBC Driver Types – Implementation of JDBC.		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods:**	**Total Periods: 45**

Text Books

1. Allen B. Downey and Chris Mayeld, "Think Java - How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2020
2. Herbert Schildt, "Java: The Complete Reference", TMH Publishing Company Ltd, 11th Edition, 2018.
3. H.M.Dietel and P.J.Dietel, "Java How to Program", 11th Edition, Pearson Education/PHI, 2017
4. Cay S. Horstmann, Gary Cornell, "Core Java Volume - I Fundamentals", 9th Edition, Prentice Hall, 2013.

Reference Books

1. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018.
2. Poaul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
3. P.J. Dietel and H.M Dietel, "Java for Programmers", Pearson Education, 9th Edition, 2011.
4. Steven Holzner, "Java 2 Black book", Dreamtech Press, 2011.

Web References

1. https://www.javatpoint.com/java-tutorial
2. https://docs.oracle.com/en/java/
3. https://www.studytonight.com/java/
4. https://onlinecourses.nptel.ac.in/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	-	1	-	-	-	-	-	-	2	3	2	1
2	3	3	3	-	3	-	-	-	-	-	-	2	3	2	1
3	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1
4	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1
5	3	3	3	1	3	-	-	-	-	-	-	2	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**V**			Course Category Code: **PC**		End Semester Exam Type: **TE**		
Course Code	**U23CET508**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM / ESE / TM
Course Name	**Foundation Engineering**			**3**	**0**	**0**	**3**	**25 / 75 / 100**
Prerequisite	Geotechnical Engineering							
Course Outcome	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)
	CO1	Understand soil exploration techniques and prepare soil investigation reports.						**K2**
	CO2	Explain the principles on bearing capacity of soil and its settlement as per codes.						**K2**
	CO3	Select various types of footings and mat foundations with settlement and pressure considerations.						**K3**
	CO4	Determine the load carrying capacity of pile foundation**.**						**K4**
	CO5	Gain knowledge about retaining structures and Stability analysis and codes.						**K2**
UNIT – I	**SOIL EXPLORATION**						**Periods:09**	
Site investigation – Soil exploration methods- Hand augers and power drills- Wash boring - samplers-sampling method - Spacing and depth of bore holes - Standard Penetration Test - Static Cone Penetration Test - Dynamic Cone Penetration Test- Subsurface soundings - Geo physical method - Preparation of soil investigation Report.								**CO1**
UNIT – II	**SHALLOW FOUNDATION**						**Periods:09**	
Classification of foundation- Types and selection criteria-- Methods to determine bearing capacity- Methods to increase BC-Terzaghi Analysis-Codal provision-Factors affecting bearing capacity -Settlement of foundations on granular and clay deposits- Seismic considerations in bearing capacity evaluation.								**CO2**
UNIT – III	**FOOTINGS AND RAFTS**						**Periods:09**	
Types of Isolated footing-Combined footing- Mat foundation-Codal provision– Contact pressure and settlement distribution -Proportioning of foundation–design of foundation.								**CO3**
UNIT – IV	**DEEP FOUNDATION**						**Periods:09**	
Pile foundations Introduction- classification-selection criteria- Individual and grouppile carrying capacity- static and dynamic approach-pile load tests- under reamed piles-IS Codal provisions. Methods to increase pile carrying capacity – Deep compaction methods – Grouting.								**CO4**
UNIT – V	**RETAINING WALLS**						**Periods:09**	
Active and passive states –Definitions, Rankine's theory – Cohesion less and cohesive soil – Earth pressure on retaining walls of simple configurations – Culmann's Graphical method – Stability analysis of retaining walls – Codal provisions.								**CO5**
Lecture Periods: 45		**Tutorial Periods: -**		**Practical Periods: -**			**Total Periods: 45**	

Text Books

1. Punmia B.C."Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 17th Edition, 2017.
2. Varghese, P.C."Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005
3. Purushothama Raj. P."Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, India 2013

Reference Books

1. Venkatramaiah.C.,"Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017
2. Modi P N, "Soil Mechanics and Foundation Engineering", second Edition Standard Book House, New Delhi, 2017.
3. Coduto,D.P."Geotechnical Engineering Principles and Practices",Prentice Hall of India Private Limited, New Delhi,2002.
4. Michael A. Joyce "Site Investigation Practice", E. & F.N. Spon, 1982
5. Murthy,V.N.S."Textbook of Soil Mechanics and Foundation engineering",CBS Publishers Distribution Ltd., New Delhi. 2014.

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1. https://www.youtube.com/watch?v=DjWDOqQjsyQ
2. https://youtu.be/V24RjCGkWRk
3. https://youtu.be/p3tzvx9-E_I
4. https://youtu.be/8108dBrySbg
5. https://youtu.be/-vAOGm2QoRI

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	1
2	3	3	3	2	-	-	-	-	-	-	-	-	1	1	2
3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	2
4	2	-	2	1	3	-	-	-	-	-	-	-	2	2	1
5	1	-	-	2	3	-	-	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23CET509**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Water Supply and Wastewater Engineering**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**Basic Civil Engineering**	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the sources, objectives, and regulatory framework of water supply systems.	**K2**
	CO2 Gain knowledge to apply the principles and design considerations of various water treatment processes and units for ensuring potable water quality.	**K2**
	CO3 Analyze the design and operation of water distribution and plumbing systems.	**K3**
	CO4 Design sewerage systems and interpret various sewage treatment processes.	**K3**
	CO5 Analyze and evaluate the principles, operations, and advancements in sewage treatment and sludge management systems to ensure safe disposal and potential reuse.	**K3**

UNIT – I	**SOURCES AND WATER SUPPLY**	**Periods:9**
Sources of water - Surface and ground water source- Objectives of water supply systems - water supply scheme- quantity of water - Design period – per capita consumption - fluctuations in demand pattern -population forecast – Arithmetic, Incremental, Geometric methods - Physical, Chemical and Biological aspects - Water Act 1974 -Water standards and quality- Role of regulatory bodies and Local bodies - Water Management system.		**CO1**
UNIT – II	**WATER TREATMENT METHODS**	**Periods:9**
Objectives - Unit operations and processes - Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation – Clarifloccuator - sand filters - Disinfection - softening, removal of iron and manganese - Defluoridation - Softening - Desalination process - Residue Management - Construction, Operation and Maintenance aspects		**CO2**
UNIT – III	**WATER STORAGE AND DISTRIBUTION**	**Periods:9**
Intake structures - pipe materials - laying, jointing, testing of pipes - methods of distributing water - storage and distribution reservoirs – plumbing system- pumping stations and their operations- House service connections.		**CO3**
UNIT – IV	**PLANNING AND DESIGN OF SEWERAGE SYSTEM**	**Periods:9**
Sewage Characteristics – sewer and sewerage -methods of collection - conservancy system, water carriage system - classification of sewerage systems- quantity of sanitary sewage - fluctuation in sewage flow - design of flow of sewage for separate, storm and combined sewers - sewer appurtenances - traps - plumbing system of drainage – one pipe system and two pipe system of plumbing - sanitary fittings.		**CO4**
UNIT – V	**SEWAGE TREATMENT AND DISPOSAL**	**Periods:9**
Principles, Functions, - Activated Sludge Process - Trickling filters - septic tank - aerobic reactor- anaerobic reactor- Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment - Construction, Operation and Maintenance aspects - Discharge standards-sludge treatment- objectives of sludge treatment - sludge digestion tank -Disposal of sludge - thickening - dewatering - conditioning - drying beds.		**CO5**

Lecture Periods:45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Garg, S.K., - Environmental Engineering I, Khanna Publishers, New Delhi, 2016
2. Modi, P.N., - Environmental Engineering I , Standard Book House, Delhi, 2016
3. Garg, S.K., - Environmental Engineering II, Khanna Publishers, New Delhi, 2016.
4. Modi, P.N., - Environmental Engineering II, Standard Book House, Delhi, 2018

Reference Books

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 2015.
2. Manual on Sewerage and Sewage Treatment Systems CPHEEO, Government of India, New Delhi, - 2013
3. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987.

4. Metcalf and Eddy, M.C., Wastewater Engineering - Treatment and Reuse II , 4Th Edition, McGraw Hill India, 2016.
5. Birdie, G.S. and Birdie, Water Supply and Sanitary Engineering, Dhanpat Raiand Sons, 2016.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements.
2. https://swayam.gov.in/nd1_noc20_ce23/preview
3. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements
4. https://swayam.gov.in/nd1_noc20_ce23/preview
5. nptel.ac.in/courses/105/104/105104102/

COs/POs/PSOs Mapping

CO s	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	1	3	2	2	2	2	2	3	3	3	3
CO2	3	2	2	2	3	2	2	2	2	2	2	3	2	2
CO3	3	3	3	3	3	2	2	2	2	2	3	3	3	3
CO4	3	3	3	3	3	2	2	2	2	2	3	3	3	3
CO5	3	3	3	3	3	2	2	2	2	2	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

Department	**Civil Engineering**	Programme: **B.Tech**						
Semester	**V**	Course Category Code: **ES**			*End Semester Exam Type: **LE**			
Course Code	**U23ITPC02**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in Java Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
(Common to All Branches)								
Prerequisite	Basic concepts of Object-Oriented Programming Principles							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Apply and practice logical formulations to solve simple problems leading to specific applications.	**K3**
	CO2 Demonstrate the use of inheritance, interface and package in relevant applications	**K3**
	CO3 Implement robust application programs in Java using exception handling and multithreading	**K3**
	CO4 Build java distributed applications using Collections and IO streams.	**K3**
	CO5 Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java.	**K3**

List of Exercises

1. Develop simple programs using java
2. Develop a java program that implements class and object.
3. Write a java program to find the frequency of a given character in a string
4. Write a java program to demonstrate inheritance and interfaces.
5. Develop a java program that implements the Packages.
6. Create java applications using Exception Handling for error handling.
7. Develop a simple real life application program to illustrate the use of Multi-Threads.
8. Implement simple applications using Collections.
9. Develop application using the concept of I/O Streams
10. Write a Java Program to demonstrate AWT and Swing Components
11. Develop a simple application and use JDBC to connect to a back-end database.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Allen B. Downey and Chris Mayeld, “Think Java - How to Think Like a Computer Scientist”, 2nd Edition, Green Tea Press, 2020
2. Sagayaraj, Denis, Karthik, Gajalakshmi, “JAVA Programming for core and advanced learners”, Universities Press Private Limited, 2018
3. Cay.S.Horstmann and Gary Cornell, “Core Java 2”, Vol 2, Advanced Features, Pearson Education, 7th Edition, 2010

Web References

1. http://www.ibm.com/developerworks/java/
2. http://docs.oracle.com/javase/tutorial/rmi/.
3. IBM’s tutorials on Swings, AWT controls and JDBC.
4. https://www.edureka.co/blog.
5. https://www.geeksforgeeks.org.

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
2	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
4	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1
5	3	2	1	1	3	-	-	-	-	-	-	-	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**			Programme: **B.Tech.**			
Semester	**V**			Course Category Code: **PC**		*End Semester Exam Type: **LE**	
Course Code	**U23CEP505**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Water and Wastewater Engineering Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

Prerequisite	Nil	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Discuss about importance of water and its quality analysis.	**K2**
	CO2 Analyze various physico-chemical and biological parameters of water and wastewater in case of quality requirements.	**K3**
	CO3 Assess complete water quality assessment for EIA and domestic supplies.	**K2**
	CO4 Suggest various types of treatment methods required to purify raw water with different contaminants.	**K2**
	CO5 Apply the laboratorial results to problem identification, quantification, and basic environmental design.	**K3**

List of Experiments:

(i)ANALYSIS OF WATER AND WASTEWATER

PHYSICAL ANALYSIS

1. Measurement of pH
2. Measurement of Conductivity
3. Determination of Turbidity by using Nephlometer.
4. Measurement of Total Solids.
5. Estimation of Total Dissolved and Total Suspended solids

CHEMICAL ANALYSIS

6. Estimation of Alkalinity.
7. Estimation of Hardness.
8. Estimation of Chlorides.
9. Estimation of Sulphate
10. Estimation of Residual Chlorine
11. Estimation of Dissolved Oxygen.
12. Estimation of Manganese.

(ii)ANALYSIS OF WASTEWATER

PHYSICAL ANALYSIS

13. Estimation of Settable solids

CHEMICAL ANALYSIS

14. Determination of optimum coagulant Dosage.
15. Estimation of COD

BIOLOGICAL ANALYSIS

16. Estimation of BOD

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 3 0**	**Total Periods :30**

Reference Books

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 2015.
2. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi,1987.
3. Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 2013.
4. Metcalf and Eddy, M.C., “Wastewater Engineering - Treatment and Reuse II”, 4Th Edition, McGraw Hill India, 2016.

5. IS10500 Indian Standards for Drinking Water.
6. IS 2490 Indian Standards for Industrial and sewage effluent discharge
Web References
1. https://swayam.gov.in/nd1_noc20_ce23/preview 2. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements?force=tru

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	2	3	3	3	3	2	3	2	2	3	2	2
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**			Programme : **B.Tech.**			
Semester	**V**			Course Category Code: **PC**		End Semester Exam Type: **LE**	
Course Code	**U23CEP506**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**REVIT Architecture Laboratory**	0	0	2	1	50	50	100
	(Common to all Branches)							
Prerequisite	Nil							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Describe building information modeling methodology and its benefits.	**K3**
	CO2 Use different parts of the Revit Architecture user interface and work with different types of architectural elements and families.	**K3**
	CO3 Use the different views listed in the Project Browser, control the visibility and graphical	**K3**
	CO4 Representation of objects in architecture model, and work with elevation, section, and 3D views.	**K4**
	CO5 Set up a project and transfer standards between projects, add and modify levels in project model, createand modify grids.	**K4**

List of Experiments

1. Introduction
2. Basic drawing and Editing Tools
3. Setting up levels and Grids
4. Modelling walls
5. Working with Doors and Windows
6. Working with Curtain Walls
7. Working with Views
8. Adding Components
9. Modelling Floors
10. Modelling Ceilings and Roofs
11. Modelling Stairs and Railing
12. 3D modeling of Residential building

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Shah.M.G., Kale. C.M. and Patki. S.Y., "Building Drawing with an Integrated Approach to BuildEnvironment", Tata McGraw Hill Publishers Limited, 2019.
2. Dr. N. Kumaraswamy, A. Kameswara Rao, Charotar Publishing- Building planning and Drawing,2017
3. Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers,2018.

Web References

1. https://www.google.com/search?q=revit+architecture+tutorialandrlz=1C1CHBD_enIN877IN877andoq=REVIT+ARCHITECTURE+tandaqs=chrome.1.69i57j0l7.13121j0j8andsourceid=chromeandie=UTF-8
2. https://www.youtube.com/watch?v=cJz20pnOGrw
3. https://www.pdfdrive.com/revit-architecture-d18827665.html.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
2	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
3	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
4	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
5	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**V**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23CEC5XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**CERTIFICATION COURSE - V**	**0**	**0**	**4**	**-**	**100**	**-**	**100**
Prerequisite	**-**							

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as “pass” on satisfactory completion. A letter grade “P” is awarded to declare pass.

(iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**		**Total Marks**
	Attendance	**MCQ Test**	
Marks	10	90	100

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**V**	Course Category Code: **PA**			*End Semester Exam Type: **-**			
Course Code	**U23CEW501**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Micro Project**	**0**	**0**	**2**	**1**	**100**	**-**	**100**

Prerequisite	**Civil Engineering**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Identify the problem statement for the micro project work through the literature survey	**K2**
	CO2 Choose the proper components as per the requirements of the design/ system**.**	**K2**
	CO3 Apply the acquainted skills to develop final model/system	**K3**

There shall be a Micro Project, which the student shall pursue as a team consists of maximum 4 students during the third year, fifth semester. The aim of the micro project is that the student has to understand the real time hardware / software applications. The student should gain a thorough knowledge in the problem he/she has selected and, in the hardware / software he/she using in the Project. The Micro-project is an application that should be formally initiated and should be developed and also to be implemented by the respective team.

The Micro Project shall be submitted in a report form along with the hardware model / software developed, duly approved by the department internal evaluation committee. It shall be evaluated for 100 marks as Continuous Assessment. The department internal evaluation committee shall consist of faculty coordinator, supervisor of the project and a senior faculty member of the department. There shall be two reviews that will be considered for assessing a Micro Project work with weightage as indicated evaluation Methods

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

COs/POs/PSOs Mapping

COs	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
1	3	2	2	2	-	-	-	-	3	3	-	1	1	1	1
2	3	3	3	2	2	2	2	2	3	3	3	1	2	2	2
3	3	2	2	1	-	2	-	-	3	3	3	1	3	3	3

Correlation Level: 1 – Low, 2 – Medium, 3 – High

Evaluation Method

Assessment	**Review 1**			**Review 2**				**Total Marks**
	Novelty	**Presentation**	**Viva**	**Presentation**	**Demonstration**	**Viva**	**Report**	
Marks	10	20	10	20	20	10	10	100

Department	**Civil Engineering**		Programme: **B.Tech.**				
Semester	**V**		Course Category Code: **MC**		*End Semester Exam Type: **TE**		
Course Code	**U23CEM505**		Periods/Week			Credit	Maximum Marks
			L	T	P	C	CAM	ESE	TM
Course Name	**Essence of Indian Traditional Knowledge**		**2**	**0**	**0**	**-**	**100**	**-**	**100**
Common to ALL Branches									
Prerequisite	**Nil**								
Course Outcomes	**On completion of the course, the students will be able to**						BT Mapping (Highest Level)		
	CO1	Familiarize with the philosophy of Indian culture					**K2**		
	CO2	Distinguish the Indian languages and literature					**K2**		
	CO3	Describe the philosophy of ancient, medieval and modern India					**K2**		
	CO4	Illustrate the information about the fine arts in India					**K2**		
	CO5	Describe the contribution of scientists of different eras					**K2**		

UNIT- I	**Introduction To Culture**	**Periods:06**
Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.		**CO1**
UNIT- II	**Indian Languages, Culture and Literature**	**Periods:06**
Indian Languages and Literature - I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India Indian Languages and Literature-II: Northern Indian languages & literature		**CO2**
UNIT- III	**Religion and Philosophy**	**Periods:06**
Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)		**CO3**
UNIT- IV	**Fine Arts in India (Art, Technology and Engineering)**	**Periods:06**
Indian Painting, Indian handicrafts, Music, divisions of Indian classical music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India		**CO4**
UNIT-V	**Education System in India**	**Periods:06**
Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India		**CO5**

Lecture Periods:30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:30**

Reference Books

1. Kapil Kapoor, “Text and Interpretation: The India Tradition”, ISBN: 81246033375, 2005
2. “Science in Samskrit”, Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007
3. NCERT, “Position paper on Arts, Music, Dance and Theatre”, ISBN 81-7450 494-X, 200
4. S. Narain, “Examinations in ancient India”, Arya Book Depot, 1993
5. M. Hiriyanna, “Essentials of Indian Philosophy”, Motilal Banarsidass Publishers, ISBN 13: 978 - 8120810990, 2014

Web References

1. https://nptel.ac.in/courses/109/104/109104102/
2. https://nptel.ac.in/courses/101/104/101104065/
3. https://nptel.ac.in/courses/109/108/109108158/
4. https://nptel.ac.in/courses/109/106/109106059/
5. https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-ae01/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
2	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
4	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CET610**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Design of Steel Structures**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	Nil							

Course Outcome			BT Mapping (Highest Level)
	On completion of the course, the students will be able to		
	CO1	To understand the design philosophy in simple practical design and behavior of steel structural Joints using bolts.	**K3**
	CO2	To understand the design philosophy in simple practical design and behavior of steel structural Joints using welds.	**K3**
	CO3	To understand the behavior of tensile member and able to design of compound sections.	**K3**
	CO4	To understand the behavior of compression member and able to design with laced and battened columns.	**K3**
	CO5	To know the knowledge of beams and purlins and able to design flexural member.	**K3**

UNIT – I	**STEEL STRUCTURAL JOINTS- BOLTED CONNECTIONS**	**Periods:09**	
Introduction to Design philosophies by limit state and working stress method. Properties of steel - Structural steel sections - Types of connections, terminologies, failures in bolted joints, Design of Joints – lap joint, single cover butt joint and double cover butt joint using bolts under axial loading - Efficiency of joints.			**CO1**
UNIT – II	**STEEL STRUCTURAL JOINTS- WELDED CONNECTIONS**	**Periods:09**	
Introduction – Advantages and Disadvantages - Types of welds: Fillet welds, groove welds, plug and slot welds - Welding symbols as per IS 813 - Welding Processes and Joint Configurations - Strength of welds - Throat thickness - effective length, - Design of fillet welds and butt welds as per IS 800 – Modes of Failures.			**CO2**
UNIT – III	**DESIGN OF TENSION MEMBERS**	**Periods:09**	
Types of sections - Design of tension members – single and compound sections – concept of shear lag - tension splices – design of lug angles.			**CO3**
UNIT – IV	**DESIGN OF COMPRESSION MEMBERS**	**Periods:09**	
Theory of columns – Modes of failures, Design of axially and eccentrically loaded members, Built-up columns, Design of Lacings and Battens, Design of Column Base.			**CO4**
UNIT – V	**DESIGN OF BEAMS AND PURLINS**	**Periods:09**	
Modes of failures- Design of Laterally supported and unsupported beams -Design of built up beam- Design of purlins - Types of roof trusses for different spans- Estimation of dead, live and wind loads.			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Subramanian, P., “Design of steel structures”, Oxford Publishers, New Delhi, 2007
2. Shiyekar, M.R., “Limit State Design in Structural Steel”, Second Edition, PHI Learning Private Ltd., Delhi, 2013. .
3. Bhavikatti, S.S., “Design of Steel Structures”, IK International Publishing House Pvt Ltd, New Delhi, 2014.

Reference Books

1. Shah, V.L., and Veena Gore, “Limit state design of Steel Structures”, Structures Publications, Pune, 2012.
2. Sai Ram K.S., “Design of Steel Structures”, Pearson Education Ltd., 2013.
3. VirendraGehlot, Ram Chandra, “Design of steel structures”, Vol.I& II, Standard Publishers, 2012.
4.IS: 800- 2007, “General Construction in Steel-Code of Practice”, Bureau of Indian Standards, New Delhi

Web References

1.https://nptel.ac.in/courses/105105162/
2.https://nptel.ac.in/courses/105106113/
3.https://nptel.ac.in/courses/105106112

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	3	1	1	-	-	-	-	3	1	3	3	3	3
2	3	3	3	2	1	-	-	-	-	3	1	3	3	3	3
3	3	3	3	2	1	-	-	-	-	3	-	-	3	3	3
4	3	3	3	2	1	-	-	-	-	3	-	-	3	3	3
5	3	3	3	2	1	-	-	-	-	3	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PC** *End Semester Exam Type: **TE**						
Course Code	**U23CET611**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Structural Analysis**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**Mechanics of Solids**		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the principles and assumptions of the slope deflection method	**K3**
	CO2	Analyze statically indeterminate beams by using moment distribution method	**K3**
	CO3	Understand the fundamentals of matrix methods for structural analysis	**K3**
	CO4	Apply the stiffness matrix method for structural analysis	**K3**
	CO5	Apply influence lines to determine maximum moments, shears and reactions due to moving loads.	**K3**

UNIT-I	**Slope Deflection Method**	**Periods: 12**	
Concepts - Deflection equation – Joint equilibrium – Limitation - Analysis of continuous beams and portal frames without sway - Non-sway analysis			**CO1**
UNIT-II	**Moment Distribution Method**	**Periods: 12**	
Definition – Stiffness – Carry over moment and carry over factor – Distribution factor at a pinned end and at a fixed end - Analysis of continuous beams and portal frames without sway - Non-sway analysis			**CO2**
UNIT-III	**Flexibility Matrix Method**	**Periods: 12**	
Introduction to matrix methods of analysis - Static indeterminacy - Concept of flexibility - Analysis of indeterminate beams with maximum three degrees using flexibility method			**CO3**
UNIT-IV	**Stiffness Matrix Method**	**Periods: 12**	
Matrix stiffness method – Transformation of displacements – Elements stiffness to system - stiffness – Application to continuous beams supports with maximum three degrees – Effects of support settlements			**CO4**
UNIT-V	**Moving Load and Influence Lines**	**Periods: 12**	
Determinate Beams: Single concentrated load moving on the span – UDL longer than the span – UDL shorter than the span– Two concentrated loads – Series of concentrated loads – Equivalent UDL Influence lines for reactions, shear force, bending moment – Load Position – Absolute maximum Bending Moment and Shear Force - UDL smaller than the span – Concentrated loads – Absolute maximum Bending Moment and Shear Force **Indeterminate beams:** Muller Breslau's principle and its applications to determine the influence lines for continuous beams.			**CO5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. Vaidyanathan R and Perumal P, Structural Analysis, Vol. 1 & 2, Laxmi Publications Pvt. Ltd, New Delhi, 2016, 4th Edition
2. Bhavikatti,S.S, Structural Analysis, Vol. 1 & 2, Vikas Publishing House Pvt. Ltd., New Delhi, 2010, 4th Edition
3. B.C.Punmia, Ashok Kumar Jain, Arun K. Jain, "Theory of Structures", Laxmi Publications Pvt. Ltd, 2017, 13th Edition
4. Arun Shyam,Karuna Basker, Structural Analysis, Medtech Publisher, 2019
5. Roy Sujit Kumar, Chakrabarty Subrata, Fundamentals of Structural Analysis: With Computer Analysis and Applications Paperback, S Chand & Company Publisher, 2003, 2nd Edition

Reference Books

1. Dr.R.P. Rethaliya, Structural Analysis-I, Atul Prakashan Publisher, 2020
2. Dr. Suresh R. Parekar, H.M. Somayya, Structural Analysis- I, Nirali Prakashan Publisher, 2014
3. Wang. C. K., Intermediate Structural Analysis, McGraw Hill Publishing Co., Tokyo, Fourth Edition, 2017.
4. Jindal, R. L., Indeterminate Structural Analysis, S. Chand and Company. New Delhi, 2000.
5. Thandavamoorthy, "Analysis of Structures", Oxford and IBH Publishers, New Delhi.2008.

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1. https://nptel.ac.in/courses/105105166/
2. https://onlinecourses.nptel.ac.in/noc20_ce35/unit?unit=50&lesson=51
3. https://nptel.ac.in/courses/105101085/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	3	1	1	-	-	-	-	-	-	-	3	3	3
2	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
3	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
4	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
5	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CET612**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Transportation Engineering**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	Basic of Civil and Mechanical Engineering							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand & Analyze the geometric design of highways	**K2**
	CO2 Understand the various test procedures for highway materials and design theories	**K2**
	CO3 Design the pavement	**K2**
	CO4 Understand the railway elements	**K2**
	CO5 Prepare airport layout and understand the various concepts and components of harbor	**K2**

UNIT – I	**HIGHWAY GEOMETRY**	**Periods:10**	
Significance of highway planning –Factors influencing highway alignment -Classification of highways –Typical cross sections - Cross sectional elements - Sight Distances, Factors affecting Sight Distances, PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD]- Gradients and its types, Design of Horizontal Alignments - Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments - Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curve			**CO1**
UNIT – II	**PAVEMENT COMPONENTS AND ANALYSIS**	**Periods:08**	
Pavement components - Types of pavements - Highway materials –– Tests on aggregates and Tests on bitumen - Calculation of stresses – Single layer, Two layer theory, Westergaard's theory, Bradbury theory (Problems in stress calculation)			**CO2**
UNIT – III	**PAVEMENT DESIGN AND MAINTENANCE**	**Periods:09**	
Pavement Design Factors in the design of flexible and rigid pavements- CBR methods - IRC recommendations on flexible pavement design (IRC37) and Rigid pavement (IRC58) (Problems in design of flexible pavement) - Highway drainage and its types - Pavement failures - Pavement evaluation –Benkelman beam deflection method			**CO3**
UNIT – IV	**RAILWAY ENGINEERING**	**Periods:09**	
Permanent way and its elements – Functions, requirements and types of Rails, Sleepers and Ballast - Rail fixtures and fastenings - Gauge and its types -Coning of wheels - Defects in rails - Super elevation – Cant deficiency, negative cant (Problems) - Widening of gauge on curves (Problems) - Transition Curves and Shift (Problems) - Points and crossings – Turn outs - Design of turnouts (Problems) – Stations and Yards - classification of stations and yards			**CO4**
UNIT – V	**AIRPORT AND HARBOUR ENGINEERING**	**Periods:09**	
Components of Airport - Airport organization – Types of airport - Runway orientation - Wind rose diagram (Problems), Basic runway length and corrections, Geometric design of Runway (Problems on Runway length) Runway Marking – Runway Lighting - Design of exit taxiway (Problems), Definition of Terms - Harbors, Ports, Docks, Littoral Drift, Satellite Ports - Requirements and Classification of Harbors - Dry and Wet Docks - Light Houses, Navigational Aids Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders Coastal Shipping			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2015.
2. S C Saxena and S P Arora, "A Textbook of Railway Engineering", Dhanpat Rai Publication, 2010.
3. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010

Reference Books

1. Kadiyali L R, "Principles and Practice of Highway Engineering", Khanna Technical Publications, Delhi, 2019.
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2018.
3. S P Bindra, "A Course in Docks and Harbour Engineering", Dhanpat Rai and Sons, New Delhi, 2018.

4. Indian Road Congress (IRC), “Guidelines for the Design of Flexible Pavements”, (Fifth Revision), IRC: 37-2018
5. Indian Road Congress (IRC),”Guidelines for the Design of Plain Jointed Rigid Pavements for Highways”, (Third Revision), IRC: 58-2017

Web References

1. http://www.yorku.ca/yaoguo/tranportation1025/
2. http://www. tranportation.cum.edu/~wn0g/2ch6a.pdf
3. https://youtu.be/0xwPILJUqsI
4. https://youtu.be/0g_KRhJ4WCI
5. https://youtu.be/ba7ue8H14Iw

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	-	-	-	-	2	2	1
2	3	3	3	2	-	-	-	-	-	-	-	-	1	1	2
3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	2
4	2	-	2	1	3	-	-	-	-	-	-	-	2	2	1
5	1	-	-	2	3	-	-	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus.

Department	**Civil Engineering**	Programme : **B.Tech**						
Semester	**VI**	Course Category Code: PC			*End Semester Exam Type: TE & LE			
Course Code	**U23CEB603**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Instrumentation and Sensor Technologies for Civil Engineering Applications**	**2**	**0**	**2**	**3**	**50**	**50**	**100**

Prerequisite	**Nil**		
Course Outcomes	***On completion of the course, the students will be able to***		**BT Mapping (Highest Level)**
	CO1	Identify the type of transducer	**K2**
	CO2	Create mathematical model of transducer	**K4**
	CO3	Identify the various types of sensor	**K2**
	CO4	Identify and understand the errors in sensor and Transducers	**K4**
	CO5	Identify and understand Characterization and Measurement Techniques	**K4**

UNIT-I	**Introduction**	**Periods: 10**
Definition of sensor/transducer-Block Diagram-elements of measurement system-sensors for sensing infrastructure, classification of sensors/transducers-static characteristics-accuracy, precision, resolution, linearity, sensitivity, range, loading effect, threshold, dead time, dead zone, span.Errors in measurement: True value, static error, static correction, scale range and scale span, error calibration curve, readability, repeatability & reproducibility, drift and noise		**CO1**
UNIT-II	**Integrated Sensing for Smart Infrastructure**	**Periods: 10**
Piezoelectric sensors: Principle of piezoelectricity, piezoelectric materials, fabrication of piezoelectric transducers, piezoelectric transducers for SHM, Bonding effects, limitations, Applications. Fiber optic sensors: properties of optical fibres, common optical fiber sensors		**CO2**
UNIT-III	**Acoustomagnetic Diagnostics for Structural Integrity**	**Periods: 10**
Acoustic Emission Sensors: Fundamentals of AE technique, Interpretation of AE signals, AE localization methods, AE equipment technology, Field applications, SHM using AE. Electromagnetic Sensors: magnetics and magnetic materials, magnetoelasticity, magnetic sensor technology, the role of microstructure in magnetization and magnetoelasticity, temperature effects, Eddy current, portable elastomagnetic stress sensor.		**CO3**
UNIT-IV	**Calibration and Characterization of Sensors and Transducers**	**Periods: 15**
1. Calibration of ammeter and voltmeter 2. calibration of RTD, thermistor and thermocouple 3. Characteristics of potentiometer. 4. Characteristics of LVDT 5. Angular displacement measurement using a capacitive transducer		**CO4**
UNIT-V	**Characterization and Measurement Techniques Using Advanced Transducers**	**Periods: 15**
1. Characteristics of load cell. 2. Characteristics of optical transducers. 3. Pressure measurement using piezoelectric transducers. 4. Measurement of current, voltage and power using hall effect transducer. 5. Characteristics of Strain gauge.		**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 60**

Text Books
1. Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann
2. David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press
3. S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis.
Reference Books
1. Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer
2. Patranabis, Sensors and Transducers, Second Edition, PHI Publisher
3. Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer

Web References
1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements.
2. https://swayam.gov.in/nd1_noc20_ce23/preview

COs/POs/PSOs Mapping

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

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

<table>
<tr><th colspan="6">Theory</th></tr>
<tr><th rowspan="2">Assessment</th><th colspan="4">Continuous Assessment Marks (CAM)</th><th rowspan="2">End Semester Examination (ESE) Marks</th><th rowspan="2">Total Marks</th></tr>
<tr><th>CAT 1</th><th>CAT 2</th><th>Model Exam</th><th>Attendance</th></tr>
<tr><td rowspan="2">Marks</td><td>5</td><td>5</td><td>5</td><td>5</td><td>75</td><td rowspan="2">60</td></tr>
<tr><td colspan="4">20(to be weighted for 10 marks)</td><td>(to be weighted for 50 marks)</td></tr>
</table>

Department	**Civil Engineering**	Programme : **B.Tech.**					
Semester	**VI**	Course Category Code: **PC**			End Semester Exam Type: **LE**		
Course Code	**U23CEP607**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**STAAD PRO V8i LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
(Common to all Branches)								
Prerequisite	Nil							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Students understand and design the basic one-dimensional elements.	**K3**
CO2	To provide hands on exercise and make the students learn the concept of designing 2D elements.	**K3**
CO3	To provide hands on training on various 3D elements and learn their challenges practically.	**K4**
CO4	Acquired practical knowledge on designing an entire G+2 (floor) buildings.	**K3**
CO5	Acquired practical knowledge on applying wind and seismic loading in building design.	**K3**

LIST OF EXPERIMENTS

1. Analysis & Experimental Validation of 2D Truss and Frame under Combined Loads
2. Behaviour of 3D Structural Elements: Beams, Columns, and Frames
3. Foundation Systems: Isolated Footings and Retaining Walls
4. Slab Systems: One-Way and Two-Way Slabs
5. Integrated Building Design and Analysis: G+2 Framed Structure
6. Earthquake Engineering: Lateral Force Analysis and Seismic Design
1.

Lecture Periods: —	**Tutorial Periods: —**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Staad Pro V8i for Beginners: With Indian Examples by T. S. Sharma, Notion Press Media Pvt Ltd.

Web References

1. STAAD Pro V8i Technical Reference Manual – Bentley Communities.
2. https://bentleysystems.service-now.com/community?id=community_forum&sys_id=f420bf06475e31109091861f536d43f6
3. https://www.youtube.com/results?search_query=staad+pro+tutorials
4. https://learnstaad.com/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
2	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
3	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
4	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
5	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**			Programme : **B.Tech.**			
Semester	**VI**			Course Category Code: **PS**		End Semester Exam Type: **LE**	
Course Code	**U23CEP608**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Transportation Engineering Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Prerequisite	Basic of Civil and Mechanical Engineering							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Carry out the test on aggregate	**K3**
	CO2 Conduct the test on bitumen	**K3**
	CO3 Design the pavement	**K4**
	CO4 Investigate the test on bituminous mix	**K3**
	CO5 Carry out the test on subgrade soil	**K3**

List of Experiments

I. Tests on Aggregate:

1. Shape Tests (Elongation index, Flakiness index, Angularity number)
2. Impact test
3. Crushing value
4. Los Angles Abrasion test
5. Specific gravity
6. Water absorption

II. Tests on Bitumen:

1. Penetration Value
2. Ductility
3. Softening point
4. Flash & fire point
5. Specific gravity
6. Viscosity of cutback Bitumen

III. Tests on Bituminous Mix

1. Marshall's test on bituminous mixes
2. Bitumen Extraction test by Centrifuge Extractor

IV. Test on Sub-grade soil

1. C.B.R. Test - (on sub grade soil)

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Kadiyali L R, "Highway Engineering", Khanna Book Publishing Co Pvt Ltd, 2019.
2. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2019.
3. Bureau of Indian Standards (BIS) Publications on Highway Materials
4. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Fifth Revision), IRC: 37-2018
5. Indian Standard (IS), Methods of test for soil, Part 16 (Second Revision), IS: 2720 (Part 16) – 1987.

Web References

1. http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/transporation_lab/labs/index.php.
2. http://www.nptelvideos.in/2012/12/ transporation_lab.html
3. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-21.pdf
4. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-26.pdf
5. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-26.pdfhttps://dwgmodels.com

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
2	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
3	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
4	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
5	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**		Programme : **B.Tech.**					
Semester	**VI**		Course Category Code: **PC**			End Semester Exam Type: **LE**		
Course Code	**U23CEP609**		Periods/Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Survey Camp**		**0**	**0**	**0**	**1**	**50**	**50**	**100**

Prerequisite	Surveying and Geomatics	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Mastery of modern surveying techniques using Theodolite, Total Station, and GPS for accurate measurements and traverses.	**K3**
	CO2 Proficiency in contour mapping through radial tachometric and block leveling methods for terrain analysis.	**K3**
	CO3 Practical skills in road and canal alignment surveying with longitudinal and cross-sectional surveys.	**K3**
	CO4 Competence in building offset and plot location for precise construction planning.	**K3**
	CO5 Application of astronomical and GPS techniques to determine azimuths and geospatial coordinates.	**K3**

List of Experiments

1. Traverse – using Theodolite / Total station
2. Contouring
   i. Radial tachometric contouring - Radial Line at Every 45 Degree and Length not less than 60 Meter on each Radial Line
   ii. Block Level/ By squares of size at least 100 Meter x 100 Meter atleast 20 Meter interval
   iii. L.S & C.S - Road and canal alignment for a Length of not less than 1 Kilo Meter atleast L.S at Every 30m and C.S at every 90m
4. Offset of Buildings and Plotting the Location
5. Sun observation to determine azimuth (guidelines to be given to the students)
6. Use of GPS to determine latitude and longitude and locate the survey camp location
7. Traversing using GPS
8. Curve setting by deflection angle

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I and II, Lakshmi Publications Pvt Ltd, New Delhi, 2016
2. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling, Parts 1 and 2, Pune Vidyarthi Griha Prakashan, Pune, 2014
3. S. K. Duggal, "Surveying, Vol. I and II ", 5th Edition, McGraw Hill, 2019.
4. Venkatramaiah, Text book of Surveying, University press, New Delhi, 2011
5. Subramanian, “Surveying and Levelling”, Oxford University Press, 2012

Web References

1. https://landsurveyorsunited.com/forum/topics/best-software-to-used-in-surveying
2. https://www.capterra.com/survey-software/
3. https://nptel.ac.in/courses/105/107/105107157/
4. https://nptel.ac.in/courses/105/107/105107122/
5. https://www.youtube.com/watch?v=d_DoEB4zWEQ

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
1	3	3	-	3	-	-	-	-	-	2	2	2	3	3	3
2	3	3	-	3	3	-	-	-	-	2	2	3	3	3	3
3	3	3	2	3	3	-	-	-	-	2	2	3	3	3	3
4	3	3	2	-	3	-	-	-	-	2	2	2	3	3	3
5	3	3	2	-	3	-	-	-	-	2	2	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**VI**	Course Category Code: **PA**			*End Semester Exam Type: **-**			
Course Code	**U23CEW602**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Mini Project**	**0**	**0**	**2**	**1**	**100**	**-**	**100**

CIVIL

Prerequisite	**Civil Engineering, C Programming**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Identify the problem statement for the mini project work through the literature survey	**K2**
	CO2 Choose the proper components as per the requirements of the design/ system**.**	**K2**
	CO3 Apply the acquainted skills to develop final model/system	**K3**

There shall be a Mini Project, which the student shall pursue as a team consists of maximum 4 students during the third year, fifth semester. The aim of the mini project is that the student has to understand the real time hardware / software applications. The student should gain a thorough knowledge in the problem he/she has selected and in the hardware / software he/she using in the Project. The Mini-project is an application that should be formally initiated and should be developed and also to be implemented by the respective team.

The Mini Project shall be submitted in a report form along with the hardware model / software developed, duly approved by the department internal evaluation committee. It shall be evaluated for 100 marks as Continuous Assessment. The department internal evaluation committee shall consist of faculty coordinator, supervisor of the project and a senior faculty member of the department. There shall be two reviews that will be considered for assessing a Mini Project work with weightage as indicated evaluation Methods.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

COs/POs/PSOs Mapping

COs	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
1	3	2	2	2	-	-	-	-	3	3	-	1	1	1	1
2	3	3	3	2	2	2	2	2	3	3	3	1	2	2	2
3	3	2	2	1	-	2	-	-	3	3	3	1	2	2	2

Correlation Level: 1 – Low, 2 – Medium, 3 – High

Evaluation Method

Assessment	**Review 1**			**Review 2**				**Total Marks**
	Novelty	**Presentation**	**Viva**	**Presentation**	**Demonstration**	**Viva**	**Report**	
Marks	10	20	10	20	20	10	10	100

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**VI**	Course Category: **AEC**			End Semester Exam Type: **-**			
Course Code	**U23CEC6XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Certification Course - VI**	**0**	**0**	**4**	**-**	**100**	**-**	**100**
CIVIL								
Prerequisite	**-**							

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as “pass” on satisfactory completion. A letter grade “P” is awarded to declare pass.

(iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**		**Total Marks**
	Attendance	**MCQ Test**	
Marks	**10**	**90**	**100**

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**VI**	Course Category: **MC**			End Semester Exam Type :**TE**			
Course Code	**U23CEM606**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Gender Equality**	**2**	**0**	**0**	**-**	**100**	**-**	**100**

Prerequisite	**-**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe the general identity, social construction of gender roles.	**K2**
	CO2 Illustrate the causes and issues of gender discrimination in Indian society.	**K2**
	CO3 Describe the workplace discrimination, media influences on gender and culture.	**K2**
	CO4 Familiarize with international and Indian frameworks on gender equality.	**K2**
	CO5 Illustrate the current challenges in gender equality, including the glass ceiling and the role of technology.	**K2**

UNIT – I	**Introduction to Gender Equality**	**Periods:06**
Gender equality – exploring gender identity and expression, Understanding the social construction of general roles and norms, historical perspectives on gender roles, Analyzing key milestones in the fight for gender equality.		**CO1**
UNIT – II	**Gender Inequality and Its Manifestations**	**Periods:06**
Gender discrimination in Indian society – causes of gender inequality – Illiteracy, patriarchal set up, lack of awareness, social beliefs, practice and custom – Issues of gender discrimination – Child marriage, child domestic work, poor education and health, violence and exploitation in workplace.		**CO2**
UNIT – III	**Gender and Culture**	**Periods:06**
Workplace discrimination, Media influences on gender and culture, Gender and power dynamics in society. Strategies for promoting gender equality and cultural understanding.		**CO3**
UNIT – IV	**Promoting Gender Equality**	**Periods:06**
Gender Equality and Human Rights – International frameworks and Conventions on Gender Equality – Equality under the Indian Constitution – Policies and initiatives for gender mainstreaming – Strategies for promoting Gender Equality in various contexts.		**CO4**
UNIT – V	**Contemporary Challenges and Future Directions**	**Periods:06**
Current challenges and emerging issues in gender equality – Glass ceiling – role of technology in continuing or challenging gender inequality – Exploring possibilities for transformative change and envisioning a gender-equal future.		**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Text Books

1. "Gender and Society" by Raewyn Connell – This book provides a comprehensive overview of gender roles, power dynamics, and the social construction of gender.
2. "The Second Sex" by Simone de Beauvoir – A historical and philosophical examination of women's oppression and gender inequality.
3. "Women and Gender in the Indian Society" by Neera Desai and Usha Thakkar – Focuses on the context of gender roles, inequality, and feminist movements in India.

Reference Books

1. Woman in early Indian societies, New Delhi: Manohar Publications. Sita A. Raman (2009).
2. A social and Cultural history, Volume1. Connecticut: Oxford: Praeger. Sita Raman (2009).
3. A social and Cultural history, Volume2. Connecticut: Oxford: Praeger.
4. Iftikhar R. (2016). Indian Feminism: Class, Gender and Identity in Medieval Ages. Chennai: Notion Press. Iftikhar, R. (2012).

Web References

1. https://www.unwomen.org
2. https://ncw.nic.in
3. https://en.unesco.org/themes/gender-equality
4. https://www.weforum.org/reports
5. https://wcd.nic.in

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
2	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
4	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100

Department	**Civil Engineering**		Programme : **B.Tech.**					
Semester	**VII**		Course Category Code: **PC**			End Semester Exam Type: **TE**		
Course Code	**U23CET713**		Periods/Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Construction Technology and Management**		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	**Construction Techniques Equipment and Practice**							
Course Outcomes	**On completion of the course, the students will be able to**							**BT Mapping (Highest Level)**
	CO1	Select and Operate Construction Equipment						**K2**
	CO2	Utilize Concreting and Material Processing Equipment						**K2**
	CO3	Apply Construction Methods and Safety Engineering						**K2**
	CO4	Understand Construction Project Management						**K2**
	CO5	Analyze Cost and Resource Optimization						**K2**

UNIT – I	**CONSTRUCTION EQUIPMENT**	**Periods: 09**	
Compaction equipment – types of compaction rollers - Hoisting and earthwork equipment – hoists, cranes, tractors, bulldozers - Graders, scrapers, draglines, and clamshell buckets - Selection, operation, and maintenance of equipment			**CO1**
UNIT – II	**CONCRETING AND MATERIAL PROCESSING EQUIPMENT**	**Periods: 09**	
Crushing equipment – jaw crushers, gyratory crushers, impact crushers - Selection and operation of crushing equipment - Screening of aggregates - Concrete mixers – types, mixing, and placing methods - Consolidation and finishing of concrete			**CO2**
UNIT – III	**CONSTRUCTION METHODS AND SAFETY ENGINEERING**	**Periods: 09**	
Earthwork and excavation methods - Piling and foundation techniques - Formwork, fabrication, and erection techniques - Quality control in construction projects - Safety engineering and risk management in construction.			**CO3**
UNIT – IV	**CONSTRUCTION PROJECT MANAGEMENT**	**Periods: 09**	
Introduction to construction project management and its relevance - Qualities of a project manager - Project planning, coordination, scheduling, and monitoring - Bar charts and milestone charts - Critical Path Method (CPM) - Project Evaluation and Review Technique (PERT)			**CO4**
UNIT – V	**COST AND RESOURCE MANAGEMENT**	**Periods: 09**	
Project cost analysis and updating - Crashing for optimum cost and optimum resources - Resource allocation techniques - Construction equipment – economic considerations - Earthwork equipment – types and selection criteria - Trucks and handling equipment – rear dump trucks, capacities, and production calculation			**CO5**

Text Books

1. 'Construction Planning, Equipment and Methods' by Peurifoy and Schexnayder , Shapira, Tata Mcgrawhill.
2. 'Construction Project Management Theory and Practice'by Kumar Neeraj Jha (2011), Pearson.
3. 'Construction Technology' by Subir K. Sarkar and Subhajit Saraswati, Oxford University press.

Reference Books

1. 'Construction Project Management - An Integrated Approach' by Peter Fewings , Taylor and Francis.
2. 'Construction Management Emerging Trends and Technologies' by Trefor Williams , Cengage learning.

Web References

1. https://nptel.ac.in/courses/105/104/105104161/
2. https://nptel.ac.in/courses/105/103/105103093/
3. https://nptel.ac.in/noc/courses/noc21/SEM1/noc21-ce20/ /

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	3	3	2	-	-	-	-	-	-	3	3	3
CO2	3	3	2	3	3	2	-	-	-	-	-	-	3	3	3
CO3	3	3	2	3	3	2	-	-	-	-	-	-	3	3	3
CO4	3	3	2	3	3	2	-	-	-	-	-	-	3	3	3
CO5	3	2	2	3	3	2	-	-	-	-	-	-	3	3	3

Correlation Level: 1-Low, 2-Medium, 3- High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

Department	**Civil Engineering**	Programme : **B.Tech.**						
Semester	**VII**	Course Category Code: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CET714**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Hydrology and Water Resource Engineering**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	Water supply and Waste water Engineering							

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Understand the hydrologic cycle, precipitation measurement, and infiltration processes for water resource estimation.	**K2**
	CO2	Analyze runoff, streamflow, hydrographs, and flood routing methods for effective flood management.	**K3**
	CO3	Apply principles of groundwater hydrology, including aquifer properties, well hydraulics, and groundwater recharge techniques.	**K2**
	CO4	Design irrigation systems, reservoirs, and canals using principles of water resource engineering for efficient water management.	**K3**
	CO5	Evaluate hydraulic structures, sediment transport, river training works, and watershed management techniques for sustainable water conservation.	**K3**

UNIT- I	**Hydrology and Precipitation**	**Periods: 09**
Hydrologic cycle, types and measurement of precipitation, gauge networks, average depth of precipitation over the basin, mass rainfall curves, intensity duration curves - hyetographs, IDF curves, estimates of missing data and adjustment of records, evaporation, transpiration – and infiltration processes with estimation methods.		**CO1**
UNIT II	**Runoff and Streamflow**	**Periods: 09**
Factors affecting runoff, Hydrograph analysis – Unit hydrograph theory and analysis, Space distribution and variability of runoff, stream flow measurement - selection of site, velocity and discharge measurements – base flow separation methods. flood routing (Muskingum method), and reservoir routing.		**CO2**
UNIT III	**Groundwater Hydrology**	**Periods: 09**
Occurrence and movement of ground water - Permeability and Transmissibility - Darcy's Law – Ground water yield - Aquifers and their types - Infiltration wells and Infiltration galleries - Measurement of yield - Recuperation test - Pumping test – Steady flow analysis only - Artificial recharge – Methods.		**CO3**
UNIT IV	**Water Resource Engineering & Irrigation**	**Periods: 09**
Water demand and planning – Irrigation and its necessity – Irrigation methods: surface, subsurface, sprinkler, and drip – Crop water requirement: duty, delta, base period – Canal design using Kennedy's and Lacey's theories – Reservoirs and storage structures – Types and functions of dams – Seepage analysis, failure modes, and control measures.		**CO4**
UNIT V	**Hydraulic Structures & Water Conservation**	**Periods: 09**
Design and components of hydraulic structures – Spillways (types and functions), Energy dissipators and stilling basins, Weirs and barrages – Design criteria and functions, Cross drainage works – Aqueducts, Syphon aqueducts, Canal escapes. Water conservation techniques – Rainwater harvesting, check dams, percolation tanks, contour bunding, and watershed management. Role of traditional and modern water conservation structures in sustainable water resource development.		**CO5**
Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -** **Total Periods: 45**

Text Books

1. Hydrology and Water Resources Engineerin by S.K. Garg, published in 2011 by Khanna Publishers.
2. Engineering Hydrolog by K. Subramanya, 4th Edition, published in 2013 by Tata McGraw-Hill Education.
3. Applied Hydrology by Ven Te Chow, David R. Maidment, and Larry W. Mays, published in 1988 by McGraw-Hill.

Reference Books

1. Hydrology in Practice by Elizabeth M. Shaw, 4th Edition, published in 2010 by CRC Press

2. Engineering Hydrology: An Introduction to Processes, Analysis, and Modeling by E.M. Wilson, 1st Edition, published in 2016 by McGraw-Hill Education.
3. Hydrology and Water Resource Systems Analysis by Maria A. Mimikou, Evangelos A. Baltas, Vassilios A. Tsihrintzis, and Haris Nakos, 1st Edition, published in 2016 by CRC Press.
4. Introduction to Water Engineering, Hydrology, and Irrigation" by Mohammad Albaji, 1st Edition, published in 2022 by CRC Press.
5. Water Resources Engineering by Ray K. Linsley, Joseph B. Franzini, David L. Freyberg, and George Tchobanoglous, 4th Edition, published in 1992 by McGraw-Hill.

Web References

1. https://www.youtube.com/watch?v=iohKd5FWZ74
2. https://www.youtube.com/watch?v=0TjTz-HsPjs
3. https://www.youtube.com/watch?v=0uJpsuRbfUo

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	1	3	2	-	-	-	-	-	-	1	3	1	2
2	2	3	1	2	2	-	-	-	-	-	-	1	3	1	-
3	3	3	3	2	2	-	-	-	-	-	-	1	2	3	-
4	3	3	2	2	3	-	-	-	-	-	-	1	2	2	3
5	3	3	2	2	3	-	-	-	-	-	-	1	1	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**VII**			Course Category Code: **PC**			End Semester Exam Type: **TE**	
Course Code	**U23CET715**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM / ESE / TM
Course Name	**Prefabricated Structures**			**3**	**0**	**0**	**3**	**25 / 75 / 100**
Prerequisite	Construction Technology and Management							
Course Outcomes	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)
	CO1	Gain knowledge of maintenance and various assessment techniques						**K2**
	CO2	Understand the methods of non-destructive testing systems						**K2**
	CO3	Understand the types and properties of repair material						**K2**
	CO4	Understand the corrosion and damaged structures						**K2**
	CO5	Gain knowledge of strengthening of structures						**K3**

UNIT- I	**INTRODUCTION**	**Periods: 09**	
Need for prefabrication – Principles – Materials – Modular coordination – Standarization – Systems –Production – Transportation – Erection.			**CO1**
UNIT II	**PREFABRICATED COMPONENTS**	**Periods: 09**	
Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls			**CO2**
UNIT III	**DESIGN PRINCIPLES**	**Periods: 09**	
Disuniting of structures – Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.			**CO3**
UNIT IV	**JOINT IN STRUCTURAL MEMBERS**	**Periods: 09**	
Joints for different structural connections – Dimensions and detailing – Design of expansion joints			**CO4**
UNIT V	**DESIGN FOR ABNORMAL LOADS**		
Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., – Importance of avoidance of progressive collapse			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Poonam I. Modi and Chirag N. Patel, “Repair and Rehabilitation of concrete structures”, PHI Learning Pvt. Ltd., 2015.
2. P.C.Varghese, “Maintenance, Repair & Rehabilitation & Minor Works of Buildings”, PHI Learning Pvt. Ltd., 2014
3. Riadh Al-Mahaidi, Robin Kalfat, “Rehabilitation of Concrete Structures with Fiber-Reinforced Polymer”, Matthew Deans, 2018

Reference Books

1. R.T.L. Allen, S.C. Edwards, and J.D.N. Shaw, “The Repair of Concrete Structures”, Blackie Academic & Professional, 2005
2. Walter F. Silva-Araya. Oladis T. De Rincon and Luis Pumarada O’Neill, “Repair and Rehabiliation of Reinforced Concrete Structures”, ASCE Publications, 1997.
3. Anibal Costa, Joao Miranda Guedes, Humberto Varum, “Structural Rehabilitation of Old buildings”, Springer, 2014
4. V.M. Malhotra,”Repair, Rehabiliation and Maintenance of Concrete Structures, and innovations in design and construction”, American Concrete Institute, 2000
5. Thomas Dyer, “Concrete Durability”, CRC Press, 2014

Web References

1. https://nptel.ac.in/courses/105/106/105106202/
2. https://onlinelibrary.wiley.com/doi/abs/10.1002/pse.140
3. https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470015902.a0021403.pub2

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	2	1	2	-	-	-	-	-	-	2	3	3
2	3	2	3	3	1	2	-	-	-	-	-	-	2	3	3
3	3	3	3	3	1	2	-	-	-	-	-	-	2	3	3
4	3	3	3	3	1	2	-	-	-	-	-	-	2	3	3
5	3	3	3	3	1	2	-	-	-	-	-	-	2	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme : **B.Tech.**					
Semester	**VII**	Course Category Code: **PC**			End Semester Exam Type: **LE**		
Course Code	**U23CEP710**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Simulation Software Laboratory (Ansys)**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Course Outcomes	On completion of the course, the students will be able to		BT Mapping (Highest Level)
	CO1	MATLAB to solve simple problems in vibration	**K4**
	CO2	Analyze the structural components using software	**K5**
	CO3	Analysis using link elements in Trusses, cables	**K5**
	CO4	Vibration analysis of spring-mass systems	**K3**
	CO5	Model analysis of beams	**K3**

LIST OF EXPERIMENTS

A. Simulation

1. MAT LAB basics, dealing with matrices, Graphing-functions of one variable and two variables
2. Use of MATLAB to solve simple problems in vibration
3. Mechanism Simulation using multi body dynamic software

B. Analysis

1. Force and stress analysis using link elements in Trusses, cables etc.
2. Stress and deflection analysis in beams with different support conditions.
   (i) Shear force and Bending Moment diagram of simply supported beam with Point Load
   (ii) Shear force and Bending Moment diagram of cantilever beam with end point load
3. Stress analysis of flat plates and simple shells.
4. Vibration analysis of spring-mass systems.
5. Model analysis of beams.
6. Fixed and Free Column Buckling Analysis

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Web References

1. https://www.youtube.com/watch?v=xK1B61XfqQU
2. https://www.youtube.com/watch?v=VKRGtG_hpig

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
1	2	3	3	1	1	-	-	-	-	-	-	-	3	3	3
2	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
3	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
4	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
5	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Department	**Civil Engineering**	Programme: **B.Tech.**					
Semester	**VII**	Course Category Code: **PC**			End Semester Exam Type: **LE**		
Course Code	**U23CEP711**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Estimation Costing and Valuation Engineering**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	Water supply and Waste water Engineering	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Measure and estimate various elements in Civil Engineering works **(K2)**	**K2**
	CO2 Prepare Detailed Estimate for a given building **(K3)**	**K3**
	CO3 Rate analysis for different types of works **(K2)**	**K2**
	CO4 Estimate the material quantities, prepare a bill of quantities and tender documents of project **(K2)**	**K2**
	CO5 Prepare value estimates and report for a residential building. **(K3)**	**K3**

LIST OF EXPERIMENTS

1. Introduction about Estimation, Costing and Valuation
2. To prepare a detailed and abstract estimate of Single roomed building for substructure (Load Bearing Structure)
   a. Earthwork Excavation for foundations
   b. P. C. C. (1:4:8) for foundations
   c. Brick Masonry in CM (1:5) for foundation and basement
   d. River sand filling for basement
   e. Plinth beam
3. To prepare a detailed and abstract estimate of Single roomed building for superstructure (Load Bearing Structure)
   a. Brick Masonry in CM (1:6) for superstructure
   b. R.C.C (1:2:4) for lintels, beams etc.
   c. R.C.C (1:2:4) for slabs
   d. Cement concrete (1:5:10) flooring
   e. Flooring with mosaic tiles
   f. Plastering with CM (1:6) for superstructure
   g. Plastering with CM (1:5) for ceiling
   h. White washing with two coats
   i. Color washing with two coats
   j. Supply and fixing of doors and windows
4. To prepare a detailed and abstract Estimate of Single storied Residential Building (Framed Structure)
5. Estimate of Septic tank with Soak pit
6. Estimate of Isolated column and Footing
7. Estimate of Box Culvert
8. Estimate of Underground Rectangular Water Tank
9. Estimation of Bar bending schedule
10. Analysis of Rates
11. Valuation

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Reference Books

1. D.D Kohli and R.C Kohli, “A Text Book of Estimating and Costing (Civil)”, S. Chand and Company Ltd., 2013
2. V. N. Vazirani, S. P. Chandola, Civil Engineering Estimating, Costing & Valuation, Khanna Publishers, 1968
3. Rangwala, Estimation, Costing and Valuation, Charotar Publishing house Pvt Ltd, 17th Edition, 2017
4. S.P. Mahajan, Sanjay Mahajan, Quantity Surveying and Valuation book, Tech India Publication series, 2017

Govt of Tamil Nadu PWD – “Standard Schedule of Rates”, 2017-18

Web References	
1.	https://mis.wbprd.gov.in/Engineering/Document/BoxCulvertorMinorBridgeSampleEstimate.pdf
2.	https://www.cphbooks.in/product/estimating-costing-and-valuation/
3.	https://www.flipkart.com/estimating-costing-civil-engineering-theory-practice-including-specification-valuation

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	3	1	1	-	-	-	-	-	-	-	3	3	3
2	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
3	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
4	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
5	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Department	Civil Engineering			Programme: **B.Tech.**			
Semester	VII			Course Category Code: **PC**		End Semester Exam Type: **LE**	
Course Code	U23CEP712	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Modeling and Analysis Laboratory**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	Water supply and Waste water Engineering	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Demonstrate the basic features of an analysis package	**K3**
	CO2 Analyze the structure using E-TABS software	**K3**
	CO3 Design the structure using E-TABS software	**K3**
	CO4 Performing analysis and interpretation of results for final design	**K3**
	CO5 Students would have gained knowledge on the usage of the software	**K3**

LIST OF EXPERIMENTS

1. Introduction to Structural Analysis and Design using ETABS
2. Introduction to various commands of ETABS and their applications in detail.
3. Analysis and Design of Trusses
4. Analysis and Design of continuous beams with fixed at both ends
5. Analysis and Design of continuous beams with simply supported at both ends
6. Analysis and Design of Plane Frames
7. Modeling Analysis and Design of G+1 Story building
8. Modeling and Analysis of G+5 Story building
9. Analysis and Design of 2D Reinforced Concrete Frame
10. Seismic Analysis and Design of 10 Story RC building

Software Required

ETABS

Lecture Periods: 30	Tutorial Periods: -	Practical Periods: -	**Total Periods: 30**

Reference Books

1. D.D Kohli and R.C Kohli, “A Text Book of Estimating and Costing (Civil)”, S. Chand and Company Ltd., 2013
2. V. N. Vazirani, S. P. Chandola, Civil Engineering Estimating, Costing & Valuation, Khanna Publishers, 1968
3. Rangwala, Estimation, Costing and Valuation, Charotar Publishing house Pvt Ltd, 17th Edition, 2017
4. S.P. Mahajan, Sanjay Mahajan, Quantity Surveying and Valuation book, Tech India Publication series, 2017

Govt of Tamil Nadu PWD – “Standard Schedule of Rates”, 2017-18

Web References

1. https://mis.wbprd.gov.in/Engineering/Document/BoxCulvertorMinorBridgeSampleEstimate.pdf
2. https://www.cphbooks.in/product/estimating-costing-and-valuation/
3. https://www.flipkart.com/estimating-costing-civil-engineering-theory-practice-including-specification-valuation

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	3	1	1	-	-	-	-	-	-	-	3	3	3
2	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
3	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
4	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
5	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**VII**	Course Category Code: **PA**			*End Semester Exam Type: **-**			
Course Code	**U23CEW703**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Project Phase II**	**0**	**0**	**4**	**2**	**50**	**50**	**100**

Prerequisite		
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Identify the problem statement for the project work through the literature survey	**K2**
	CO2 Choose the proper Methodology as per the requirement of the project**.**	**K2**

Project work may be assigned to a group of students not exceeding 4 per group, under the supervision of project supervisor(s). Each student batch shall be required to undertake a suitable project in industry / research organization / department in consultation with the Head of the Department and the supervisor. A student shall register for the Project Phase I and II in 7th and 8th semester respectively. The project team and the project title can be decided in the 6th semester itself.

Criteria for Assessment of Project Work

- Interim project report shall be submitted before the project review with the approval of the supervisor. The Project Report prepared according to the approved guidelines and duly signed by the supervisor and the Head of the Department shall be submitted as per the timeline announced by the department.
- The End Semester Examination for the project work shall consist of an evaluation of the final project report by an external examiner, followed by a viva-voce examination conducted by a committee consisting of the external examiner and an internal examiner. The Controller of Examinations (CoE) shall appoint Internal and External Examiners for the End Semester Examination of the Project Work. Internal Evaluation – 50 Marks and External Evaluation – 50 marks.

Evaluation Method

Sl. No	Description			Weightage
1	**Continuous Assessment Marks**			
a	Review 1	Review Committee#	10	15
		Supervisor	5	
b	Review 2	Review Committee#	10	15
		Supervisor	5	
c	Review 3	Review Committee#	15	20
		Supervisor	5	
			Total CAM	50
2	**End Semester Marks**			
a	Evaluation of Phase I report and Viva-voce	Report	15	50
		Presentation and Viva	20	
		Demonstration	15	
			Total ESM	50
			Total Marks	100

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 60**	**Total Periods: 60**

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**VII**	Course Category Code: **PA**			*End Semester Exam Type: **-**			
Course Code	**U23CEW704**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Internship / Implant Training**	**0**	**0**	**2**	**1**	**100**	**-**	**100**
CIVIL								
Prerequisite	**Civil Engineering, C Programming**							
Course Outcomes	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)

The student is required to undergo 'internship' in industry / research laboratory / higher learning institution for a minimum period of 4 weeks during vacations and shall complete the internship before the completion of 7th semester.
(i) The internship carries 1 credit.
(ii) Each spell of internship shall be for a period not less than 2 weeks.
(iii) The main purpose of internship is to enhance the general professional outlook and capability of the student to advance his/her chances of improving the career opportunities. The student should get prior approval from the Head of the Department and Training and Placement cell in the college before undertaking the internship and need to submit a detailed report after completion for the purpose of assessment. The internship marks will be given in 7th semester mark sheet.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 200**	**Total Periods: 200**

Department	**Civil Engineering**	Programme : **B.Tech.**						
Semester	**VIII**	Course Category Code: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23HSTC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Entrepreneurship and Business Management**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	-							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Examine the types and importance of entrepreneurship	**K4**
	CO2 Demonstrate about Small Scale Enterprise	**K2**
	CO3 Analyse various entrepreneurial opportunities	**K4**
	CO4 Evaluate various Institutional support	**K5**
	CO5 Elaborate on Women Entrepreneurship and Rural Entrepreneurship	**K6**

UNIT- I	**Introduction to Entrepreneurship**	**Periods: 07**
Entrepreneur and entrepreneurship- Definition - Nature of Entrepreneurship- Entrepreneur Background and Characteristics - Types, Ethics and Social Responsibilities of an Entrepreneur. Entrepreneurship: Importance, Growth and Role of Entrepreneurship in Economic Development– EDPs in India and Social Entrepreneurship.		**CO1**
UNIT II	**Creativity and the Business Idea for Micro and Small Enterprises**	**Periods: 10**
Sources of New Ideas - Methods of Generating Ideas - Creative Problem Solving – Innovation – Types – Definition & Classification of New Product – Opportunity Recognition – Product Planning and Development Process – Establishing Evaluation Criteria - Micro and Small-Scale Enterprise: Definition, Characteristics - Steps involved to start SSE - Problems of SSE		**CO2**
UNIT III	**Formulation of Business Plan & Project Appraisal**	**Periods: 09**
Business Plan – Meaning &Definition – Contents of Business Plan – Significance of Business Plan – Formulation of Business Plan – Planning Commission's Guidelines for Formulating Project Report – Network Analysis – Common Errors in Business Plan formulation. Concept of Project Appraisal – Methods of Project Appraisal – Economic Analysis – Financial Analysis – Market Analysis – Technical Feasibility – Managerial Competence - Environmental Clearance for Small Scale Enterprise.		**CO3**
UNIT IV	**Institutional Finance to Entrepreneurs & Taxation Benefits**	**Periods: 09**
Institutional Finance - Meaning & Definition - Sources of Finance - Institutional support to small enterprise: Need - Institutional support by State and Central Government - SWOT Analysis – Tax Benefits – Types - Rational Behind tax benefits - Incentives and concession for Small-Scale and Tiny Industries		**CO4**
UNIT V	**Women Entrepreneurship and Entrepreneurship in Informal Sector**	**Periods: 08**
Women Entrepreneurship – Functions – Growth of women Entrepreneurship – Problems faced by Women Entrepreneurs – Development of women Entrepreneurship – Rural Entrepreneurship – Tourism Entrepreneurship – Agri-Preneurship – Social Entrepreneurship.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Robert D. Hisrich, Michael P. Peters & Dean A. Shepherd – Entrepreneurship (Tata McGraw Hill) 10th Edition, 2017.
2. S.S. Khanka: Entrepreneurial Development (S. Chand) Revised Edition, 2012

Reference Books

1. Poornima M. Charantimath: Entrepreneurship Development in Small Business Enterprises (Pearson Education)
2. Prasanna Chandra: Projects Planning Analysis, Reductions implementation & Review (Tata McGraw Hill) Sahey and Nirjar: Entrepreneurship (Excel)
3. Vasant Desai: The Dynamics of Entrepreneurial Development and Management (Himalaya Publishing House)
4. 5. K. Nagarajan: Project Mangement (New Age International Publishers)
5. Poornima M. Charantimath: Entrepreneurship Development in Small Business Enterprises (Pearson Education)

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	3	2	1	-	-	-	-	-	-	-	3	3	3
2	3	1	2	1	2	-	-	-	-	-	-	-	3	3	3
3	2	2	3	2	3	-	-	-	-	-	-	-	3	3	3
4	2	1	3	1	3	-	-	-	-	-	-	-	3	3	3
5	2	-	3	2	2	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	10	25	5	100*	100

Department	**Civil Engineering**	Programme: **B. Tech.**						
Semester	**VII**	Course Category Code: **PA**				*End Semester Exam Type: **-**		
Course Code	**U23CEW703**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Project Phase II**	**0**	**0**	**4**	**2**	**50**	**50**	**100**
Prerequisite								

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Take up any challenging practical problems and find solution by formulating proper methodology	**K2**
	CO2 To arrive at the conclusions of the findings from the project.	**K2**

Project work may be assigned to a group of students not exceeding 4 per group, under the supervision of project supervisor(s). Each student batch shall be required to undertake a suitable project in industry / research organization / department in consultation with the Head of the Department and the supervisor. A student shall register for the Project Phase II in 8th semester. The project team and the project title can be decided in the 6th semester itself.

Criteria for Assessment of Project Work

- Interim project report shall be submitted before the project review with the approval of the supervisor. The Project Report prepared according to the approved guidelines and duly signed by the supervisor and the Head of the Department shall be submitted as per the timeline announced by the department.
- The End Semester Examination for the project work shall consist of an evaluation of the final project report by an external examiner, followed by a viva-voce examination conducted by a committee consisting of the external examiner and an internal examiner. The Controller of Examinations (CoE) shall appoint Internal and External Examiners for the End Semester Examination of the Project Work. Internal Evaluation – 50 Marks and External Evaluation – 50 marks.

Evaluation Method

Sl. No	Description			Weightage
1	**Continuous Assessment Marks**			
a	Review 1	Review Committee#	10	15
		Supervisor	5	
b	Review 2	Review Committee#	10	15
		Supervisor	5	
c	Review 3	Review Committee#	15	20
		Supervisor	5	
		Total CAM		50
2	**End Semester Marks**			
a	Evaluation of final report and Viva-voce	Report	20	80
		Presentation and Viva	40	
		Demonstration	20	
b	Expected Outcome from the project ##	Publication / communication of papers / prototypes/ patents etc		20
		Total ESM		**100**
		Total Marks		**150****

Review committee consists of internal faculty members nominated by the Head of the Department. The Supervisor of the student being examined shall not be part of the committee.

Expected outcome from the project, in terns of paper publication, patents, product development and industry projects shall be awarded based on the document proof submitted by the student concerned

** To be weighted for 100 marks

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 200**	**Total Periods: 200**

Professional Elective – I

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category Code: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CEE401**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**COMPOSITE STRUCTURES**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	Design of Steel Structures		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the mechanism of composite action between steel and concrete and thereby determining capacity of shear studs	**K3**
	CO2	Design a composite beams with or without profile decking sheet either simply supported or continuous end conditions using Indian and Euro code-4	**K3**
	CO3	Design a composite slab with the provision of profile decking sheet using Euro code – 4	**K3**
	CO4	Design an encased as well as in-filled composite columns using Euro code – 4.	**K3**
	CO5	Understand the mechanism of connections in composite structures and the concept of sandwich construction	**K3**

UNIT – I	**INTRODUCTION**	**Periods:09**	
Composite Structures- Advantages, Types and Materials used, Shear Connection- Composite action-No interaction-Full interaction, slip in composite structures. Shear Connectors- Types (Rigid, Flexible and Bond), strength of shear connectors – Test on shear connectors.			**CO1**
UNIT – II	**DESIGN OF COMPOSITE BEAMS**	**Periods: 09**	
propped condition – un-propped condition – simply supported and continuous beams – beam with and without profile sheeted deck slab – Analysis and design of composite beams without profile sheet and with profile sheet.			**CO2**
UNIT – III	**DESIGN OF COMPOSITE SLABS**	**Periods: 09**	
Composite floors – Introduction of composite floors – shear transferring mechanism in profile deck system – Bending resistance of composite slab – Design consideration of composite floor - propped condition – un-propped condition. Design of simply supported and continuous Composite floor.			**CO3**
UNIT – IV	**DESIGN OF COMPOSITE COLUMNS**	**Periods: 09**	
Types of Composite columns – design of encased columns – design of in-filled columns – axial and uni-axially loaded columns.			**CO4**
UNIT – V	**MISCELLANIES TOPICS**	**Periods: 09**	
Case studies on steel concrete composite construction in buildings, Composite bridges, Connections in composite structures, Steel concrete composite sandwich construction.			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Johnson R.P. “Composite Structures of Steel and Concrete”’ Volume-I, Black Well Scientific Publication, U.K. 1994.
2. Teaching Resources for “Structural Steel Design”. Vol.2 of 3, Institute of Steel Development and Growth (INSDAG), 2000.
3. Collings D. “Steel Concrete Composite Buildings”, Thomas Telford Ltd, 2010

Reference Books

1. Narayanan R, “Composite steel structures – Advances, design and construction”, Elsevier, Applied science, UK, 1987.
2. IS: 11384, Code of practice for composite construction in Structural Steel and Concrete.
3. Provisions of IS 800 : 2007, Code of practice for General construction in Steel .

Web References

1. http://www.yorku.ca/yaoguo/math1025/slides/chapter/kuttler-linearalgebra –slides- systems of equation-handout.pdf
2. http://www.math.cum.edu/~wn0g/2ch6a.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	1	2	-	3	-	-	-	-	-	-	-	3	-	-
2	1	2	-	3	-	-	-	-	-	-	-	3	-	-
3	1	2	-	3	-	-	-	-	-	-	-	3	-	-
4	1	2	-	3	-	-	-	-	-	-	-	3	-	-
5	1	2	-	3	-	-	-	-	-	-	-	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*****Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme : **B.Tech.**						
Semester	**IV**	Course Category Code: **PE**			End Semester Exam Type: TE			
Course Code	**U23CEE403**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**BUILDING SERVICES**	3	0	0	3	25	75	100

Prerequisite	Basic Mathematics	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Find essential services for the building	**K3**
	CO2 Choose appropriate equipment for building	**K3**
	CO3 Select lighting facilities in the building	**K3**
	CO4 Choose suitable air conditioning system for the building	**K3**
	CO5 Choose fire safety systems for various types of building	**K3**

UNIT- I	**MACHINERIES**	**Periods: 09**
Hot Water Boilers - Lifts and Escalators - Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers - DC/AC motors – Generators – Laboratory services - Gas, water, air and electricity		**CO 1**
UNIT- II	**ELECTRICAL SYSTEMS IN BUILDINGS**	**Periods: 09**
Basics of electricity - Single / Three phase supply - Protective devices in electrical installations - earthing for safety - Types of earthing - ISI specifications - Types of wires, wiring systems and their choice – Planning electrical wiring for building - Main and distribution boards - Transformers and switch gears - Layout of substations.		**CO 2**
UNIT - III	**PRINCIPLES OF ILLUMINATION AND DESIGN**	**Periods: 09**
Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.		**CO 3**
UNIT - IV	**REFRIGERATION PRINCIPLES AND APPLICATIONS**	**Periods: 09**
Refrigerants - Refrigerant control devices - Electric motors - Starters - Air handling units - Cooling towers – Window type and packaged air - conditioners - Chilled water plant - Fan coil systems - Water piping – Cooling load – Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C.Systems.		**CO 4**
UNIT - V	**FIRE SAFETY INSTALLATION**	**Periods: 09**
Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C.systems.		**CO 5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Lillesand T.M. and Kiefer,R.W. Remote Sensing and Image interpretation, Seventh edition of John Wiley & Sons-2015, ISBN : 978-1-118-91947-7
2. Bhatta B, Remote Sensing and GIS, Edition: 2021, Oxford Press, ISBN: 9780199496648, 9780199496648.

Reference Books

1. Charles Elachi and Jakob J. van Zyl , Introduction To The Physics and Techniques of Remote Sensing , Wiley Series in Remote Sensing and Image Processing, 2006.
2. Paul Curran P.J. Principles of Remote Sensing, ELBS; 1995
3. Sabins, F.F.Jr, Remote Sensing Principles and Image interpretation, W.H.Freeman & Co,1978.
4. Verbyla, David, Satellite Remote Sensing of Natural Resources. CRC Press, 1995.
5. .Lo.C.P. Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006.

Web References

https://www.arcgis.com/apps/Cascade/index.html?

https://mgimond.github.io/Spatial/introGIS.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	1	3	1	2	1	3	3	2	1	2	1	1
2	3	3	1	3	1	2	1	3	3	2	1	2	1	1
3	3	3	1	2	2	2	1	3	3	2	1	2	2	1
4	3	2	3	2	3	2	1	3	3	2	1	2	1	1
5	3	2	3	2	3	2	1	3	3	2	1	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme : **B.Tech.**						
Semester	**IV**	Course Category Code: **PE**			End Semester Exam Type: TE			
Course Code	**U23CEE404**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Remote Sensing and GIS**	3	0	0	3	25	75	100
Prerequisite	**Surveying and Geomatics**							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Recognize the physics of Remote sensing and to identify the principles	**K2**
	CO2 Know about the various platforms and orbits used for launching remote sensing satellites.	**K2**
	CO3 Differentiate the types and configuration of various satellites and sensors.	**K2**
	CO4 Recognize the importance of the basics of Geographical Information System.	**K2**
	CO5 Perform data analysis techniques using GIS for various applications of Civil Engineering.	**K2**

UNIT- I	**PHYSICS OF REMOTE SENSING**	**Periods: 09**
Remote Sensing - Definition - Components - Electro Magnetic Spectrum – Basic wave theory – Particle theory – Stefan Boltzmann law – Wien's-Displacement Law - Radiometric quantities - Effects of AtmosphereScattering – Different types –Absorption-Atmospheric window- Energy interaction with surface features – Spectral reflectance of vegetation, soil and water –atmospheric influence on spectral response patterns- multi concept in Remote sensing		**CO 1**

UNIT- II	**PLATFORMS**	**Periods: 09**
Orbit elements – Types of orbits – Motions of planets and satellites – Launch of space vehicle – Orbit perturbations and maneuvers – escape velocity - Types and characteristics of different remote sensing platforms – sun synchronous and geo synchronous satellites.		**CO 2**

UNIT - III	**OPTICAL SENSORS**	**Periods: 09**
Classification of remote sensors – selection of sensor parameters - resolution concept - Spectral, Radiometric and temporal resolution – Quality of images in optical systems – imaging mode – photographic camera – optomechanical scanners – push broom and whiskbroom cameras – Panchromatic, multi spectral , hyperspectral scanners – geometric characteristics of scanner imagery - Earth resource satellites operating with optical sensors- Landsat, SPOT, IRS, WorldView.		**CO 3**

UNIT - IV	**FUNDAMENTALS OF GIS**	**Periods: 09**
Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.		**CO 4**

UNIT - V	**DATA ANALYSIS & APPLICATIONS**	**Periods: 09**
Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Elevation models - 3D data collection and utilization- Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.		**CO 5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Lillesand T.M. and Kiefer,R.W. Remote Sensing and Image interpretation, Seventh edition of John Wiley & Sons-2015, ISBN : 978-1-118-91947-7
2. Bhatta B, Remote Sensing and GIS, Edition: 2021, Oxford Press, ISBN: 9780199496648, 9780199496648.

Reference Books

1. Charles Elachi and Jakob J. van Zyl , Introduction To The Physics and Techniques of Remote Sensing , Wiley Series in Remote Sensing and Image Processing, 2006.
2. Paul Curran P.J. Principles of Remote Sensing, ELBS; 1995
3. Sabins, F.F.Jr, Remote Sensing Principles and Image interpretation, W.H.Freeman & Co,1978.
4. Verbyla, David, Satellite Remote Sensing of Natural Resources. CRC Press, 1995.
5. Lo.C.P. Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	2	3	1	-	-	3	3	2	-	2	1	3	2	2
2	2	2	1	-	3	2	3	2	-	2	1	3	3	2
3	3	3	1	-	3	3	3	3	-	2	1	3	3	2
4	3	2	2	-	3	3	3	3	3	3	1	3	3	2
5	3	2	3	2	2	3	3	3	3	3	1	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**IV**			Course Category Code: **PE**			*End Semester Exam Type: **TE**	
Course Code	**U23CEE405**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM / ESE / TM
Course Name	**Alternative Building Materials and Technologies**			**3**	**0**	**0**	**3**	**25 / 75 / 100**
Prerequisite	**Building Material and Construction**							
Course Outcome	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)
	CO1	Understand the various energies involved in the construction						**K2**
	CO2	Understand the different types alternative materials						**K2**
	CO3	Identify various eco-friendly materials						**K2**
	CO4	Recognize suitable alternative building technologies						**K2**
	CO5	Apply the cost concept involved in the planning of construction						**K3**

UNIT-I	**Introduction**	**Periods: 09**	
Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Environmental friendly and cost-effective building technologies, Requirements for buildings of different climatic regions.			**CO1**
UNIT-II	**Sustainable Materials**	**Periods: 09**	
Characteristics of building blocks for walls - Stones and Laterite blocks - Bricks and hollow clay blocks - Concrete blocks - Stabilized mud blocks - Fal-G Blocks - Manufacture of stabilized blocks.			**CO2**
UNIT-III	**Alternative Building Materials**	**Periods: 09**	
Fibre reinforced concretes – Types: metal and synthetic - Properties and applications - Fibre reinforced plastics – Types: organic and synthetic - Properties and applications. Building materials from agro and industrial wastes - Types of agro wastes - Types of industrial and mine wastes - Properties and applications			**CO3**
UNIT-IV	**Alternative Building Technologies**	**Periods: 09**	
Alternatives for wall constructions, composite masonry, confined masonry, cavity walls, Ferro cement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. Top down construction, Mivan Construction Technique, 3D Printing Technology. Alternate Roofing Systems: Concepts, Filler slabs, Composite beam panel roofs			**CO4**
UNIT-V	**Machines & Planning Control**	**Periods: 09**	
Machines for manufacture of concrete, Equipment for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives			**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, “Alternative Building Materials and Technologies”, New Age International Publishers, 2017.
2. BT Ashwini Manjunath, “Alternative Building Materials and Technology”, Medtech Publisher, 2017.
3. Trevor M. Letcher and Janet L. Scott, “Materials for a Sustainable Future”, Royal Society of Chemistry, 2012

Reference Books

1. S Christian Johnson, “Concrete Technology”, Dipti Press, 2017.
2. G.C Sahu and Jayagopal Jena, “Building Materials and Construction”, McGraw hill Publication, 2015.
3. B C Punmia and Ashok kumar jain, “Building Construction”, Laxmi Publication, 2019.
4. M.S. Shetty, “Concrete Technology (Theory and Practice)”, S. Chand & Company Ltd. 2019.
5. S.K. Duggal, “Building Materials”, 5th edition, New age International Publication, 2020.

Web References

1. https://nptel.ac.in/courses/105/102/105102175/
2. https://nptel.ac.in/courses/105/102/105102195/
3. https://alison.com/course/sustainable-architecture-energy-efficiency-and-quality

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	2	-	-	-	-	3	3	2	-	2	1	3	2	2
2	2	-	-	-	3	2	3	2	-	2	1	3	3	2
3	3	-	-	-	3	3	3	3	-	2	1	3	3	2
4	3	-	-	-	3	3	3	3	3	3	1	3	3	2
5	3	-	-	2	2	3	3	3	3	3	1	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Professional Elective Courses – II (Offered in Semester V)

Course Code	Course Title
U23CEE506	Advanced Design of RCC Structures
U23CEE507	Air and Noise Pollution
U23CEE508	Sustainable and Lean Construction
U23CEE509	Airport and Harbor Engineering
U23CEE510	Green Building Technology

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CEE506**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Advanced Design of RCC Structures**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	DESIGN OF RC ELEMENTS		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the behavior of Concrete Material subjected to various conditions	**K3**
	CO2	Understand the limit state design of columns and beams	**K3**
	CO3	Understand the serviceability limit state in short and long term conditions	**K3**
	CO4	Understand the special RC structural elements	**K3**
	CO5	Understand the Limiting analysis of beams and slabs	**K3**

UNIT – I	**BASICS OF STRUCTURAL DESIGN**	**Periods:09**	
Behaviour of concrete under uni-axial compression, Tension, and combined stresses- Modulus of Elasticity and Poisson's Ratio-Creep, shrinkage and temperature effects on concrete- Bearing strength of Concrete- Moment curvature relationship and ductility of R.C. members under monotonic and cyclic loading-Confined Concrete- Reinforcing steel.			**CO1**
UNIT – II	**DESIGN PHILOSOPHY**	**Periods:09**	
Behavior of short and long columns – Limit State Design of Short and Long Columns with Biaxial bending - Interaction curves- Design of beam column joints (problem for type1 only).			**CO2**
UNIT – III	**SERVICEABILITY LIMIT STATES**	**Periods:09**	
Estimation of deflections and crack widths in RC members.			**CO3**
UNIT – IV	**SPECIAL RC MEMBERS**	**Periods:09**	
Behaviour and design of special RC member - deep beams, design of shear walls, corbels and pile caps.			**CO4**
UNIT – V	**ANALYSIS OF RC MEMBERS**	**Periods:09**	
Limit analysis of RC members: moment redistribution in continuous beams, Yield Line theory of slabs, Introduction to Strip theory for the analysis of slabs.			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Punmia, B.C and Jain, A.K, Limit state design of Reinforced Concrete, Lakshmi Publications (P) Ltd., New Delhi, First Edition, 2007
2. Varghese P.C, "Advanced Reinforced Concrete Design", Prentice Hall of India, 2011.
3. Subramanian.N., Design of Reinforced Concrete Structures, Oxford University, New Delhi,2013.

Reference Books

1. Sinha, S.N, Reinforced Concrete Design, 2nd Edition, Tata Mc-Graw-Hill Publishing Company Limited, New Delhi, 2002.
2. UnnikrishnaPillai and DevdasMenon, Reinforced Concrete Design, Tata McGraw Hill Publishing Company Ltd., New Delhi, Third edition, 2011
3. Shah V.L. and Karve, S.R, Advanced Reinforced Concrete Design, Structures Publications, Pune, 2002.
4. IS 456-2000 Plain and Reinforced Concrete – Code of Practice, Bureau of Indian Standards, New Delhi
5. IS 875- 1987 (Part 1), Code of Practice for Design Loads (Other than Earthquake) For Buildings and Structures, Bureau of Indian Standards, New Delhi.

Web References

1. https://nptel.ac.in/courses/105/105/105105105/
2. https://nptel.ac.in/courses/105/105/105105104/
3. https://nptel.ac.in/courses/105/106/105106176/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	1	2	-	3	-	1	1	-	-	-	-	3	-	-
2	1	2	-	3	-	1	1	-	-	-	-	3	-	-
3	1	2	-	3	-	1	1	-	-	-	-	3	-	-
4	1	2	-	3	-	1	1	-	-	-	-	3	-	-
5	1	2	-	3	-	-	1	-	-	-	-	3	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus.

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: PE			*End Semester Exam Type: **TE**			
Course Code	**U23CEE507**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Air And Noise Pollution**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	-	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Identify the types and sources of air pollutants	**K2**
	CO2 Predict the effects of air pollutants on human health and the environment	**K2**
	CO3 Choose appropriate technologies for removal of particulates and gaseous pollutants	**K2**
	CO4 Measure the pollutant concentration in indoor environment	**K2**
	CO5 Suggest the control techniques for Noise pollution.	**K2**

UNIT – I	**INTRODUCTION**	**Periods:9**	
Air pollutants – Sources – Classification of air pollutants – Particulates and gaseous pollutants – Effects of air pollutants on human health, vegetation and property – Global issues and air pollution – Global warming – Ozone layer depletion – Ambient air quality and emission standards – Air pollution indices – Air act			**CO1**

UNIT – II	**METEOROLOGY AND AIR POLLUTION**	**Periods:9**	
Meteorology and Air pollution – Atmospheric stability – Inversions – Mixing height –Plume behaviour – Plume rise estimation – Effluent dispersion theories –Air pollutants Modelling			**CO2**

UNIT – III	**CONTROL OF PARTICULATE POLLUTANTS**	**Periods:9**	
Control of Air pollutants: particulates – Filters – Gravitational settling chambers – Centrifugal-multiple type cyclones – Collection efficiency - Electrostatic precipitators – Wet collectors-Centrifugal spray scrubbers - Venturi scrubbers			**CO3**

UNIT – IV	**GASEOUS POLLUTION CONTROL**	**Periods:9**	
Gaseous pollution control – Absorption - Principles – Description of equipment, Adsorption – Principal adsorbents – Equipment descriptions – Condensation – Contact condensers, Incineration –Equipment description			**CO4**

UNIT – V	**NOISE POLLUTION CONTROL**	**Periods:9**	
Sound and noise - Source of noise pollution - Environmental and industrial noise -Effects of noise pollution - Fundamentals of sound - generation, propagation, etc., Sound measurement, sound level meters – Measures for prevention and control of noise -Environmental and industrial noise - Noise control legislation			**CO5**

Lecture Periods:45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Rao.M.N. et al., Air Pollution, Tata Mc.Graw Hill, 2018.
2. Rao.C.S., Environmental Pollution Control Engineering , New Age International Publishers, 2017

Reference Books

1. Noel de Nevers, Air Pollution Control Engineering, Mc.Graw Hill, New York. 2016.
2. Stern, A.C., Air Pollution, Vol.I, II and III, Academic Press, 2015.
3. Cunniff, P.F., Environmental Noise Pollution, John Wiley and Sons, 2017.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements
2. https://swayam.gov.in/nd1_noc20_ce23/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	2	3	3	3	3	2	3	2	2	3	2	2
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23CEE510**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Sustainable and Lean Construction**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite								

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe the various sustainable materials used in construction.	**K3**
	CO2 Explain the method of estimating the amount of energy required for building.	**K3**
	CO3 Describe the features of LEED, TERI and GRIHA ratings of buildings.	**K3**
	CO4 Explain the core concepts of lean construction tools and techniques and their importance inachieving better productivity.	**K3**
	CO5 Apply lean tools & techniques to achieve sustainability in construction projects.	**K3**

Unit – I	**Introduction & materials used in sustainable construction**	**Periods:09**	
Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO2 contribution from cement and other construction materials - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability.			**CO1**
Unit – II	**Energy calculations**	**Periods:09**	
Components of embodied energy-calculation of embodied energy for construction materials - Energy concept and primary energy-Embodied energy via-a-vis operational energy in conditioned building-Life Cycle energy use.			**CO2**
Unit – III	**Green buildings**	**Periods:09**	
Control of energy use in building – National Building Code (NBC), ECBC code, codes in neighboringtropical countries - OTTV concepts and calculations – Features of LEED and TERI – Griha ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling -Performance ratings of green buildings - Zero energy building'			**CO3**
Unit – IV	**Core concepts in lean**	**Periods:09**	
Introduction to the Course; Lean Overview; Need for Productivity Measurement and improvement; Productivity Measurement System (PMS).			**CO4**
Unit – V	**Lean construction tools and techniques**	**Periods:09**	
Sampling/ Work Sampling; Survey/ Foreman delay survey; Value Stream/ Process Mapping– 5S, Collaborative Planning System (CPS)/ Last Planner System (LPS) – Big Room Approach, IT/BIM and Lean, How to Start Practicing Lean Tools in Project Site.			**CO5**

Lecture Periods:45	**Tutorial Periods:-**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment,Butterworth Heinemann Publishers, 2011.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.
3. Salem, O., Solomon, J., Genaidy, A. and Luegring, M., Site implementation and Assessment ofLean Construction Techniques, Lean Construction Journal, 2005.

Reference Books

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition, WileyPublishers 2016.
2. Ballard, G., Tommelein, I., Koskela, L. and Howell, G., Lean construction tools and techniques,2002.

Web References

1. https://onlinecourses.nptel.ac.in/noc22_ce49
2. https://archive.nptel.ac.in/courses/105/106/105106213
3. https://archive.nptel.ac.in/courses/105/102/105102195
4. https://onlinecourses.nptel.ac.in/noc21_mg85

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	2	-	1	1	-	2	3	1	1	-	2	3	2	3
2	3	1	3	2	1	2	2	-	1	1	1	3	2	3
3	2	2	3	1	1	1	1	-	-	-	3	3	3	3
4	3	1	3	2	2	1	3	1	1	1	3	3	3	3
5	3	1	2	2	2	2	3	1	-	1	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**V**			Course Category Code: **PE**		End Semester Exam Type: **TE**		
Course Code	**U23CEE509**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Airports And Harbours**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	Transportation Engineering							

Course Outcome		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Gain an insight on the planning and site selection of Airport Planning and design	**K2**
	CO2	Knowledge on Design of various Airport components	**K2**
	CO3	Analyze and design the elements for orientation of runways and passenger facility systems	**K3**
	CO4	Understand the various features in Harbours and Ports, their construction, coastal protection works	**K2**
	CO5	Knowledge on various Environmental Regulations and Acts	**K2**

UNIT – I	**AIRPORT PLANNING**	**Periods:09**	
Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area			**CO1**
UNIT – II	**AIRPORT COMPONENTS**	**Periods:09**	
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.			**CO2**
UNIT – III	**AIRPORT DESIGN**	**Periods:09**	
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 Control Tower- Instrumental Landing.			**CO3**
UNIT – IV	**SEAPORTS COMPONENTS AND CONSTRUCTION**	**Periods:09**	
Definition of Basic Terms: Harbor, Port, Satellite Port, Docks- Dry and Floating Dock, Waves and Tides – Planning and Design of Harbors: Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins Floating Landing Stage – Navigational Aids-Inland Water Transport.			**CO4**
UNIT – V	**SEAPORT REGULATIONS AND EIA**	**Periods:09**	
Wave action on Coastal Structures and Shore Protection and Reclamation – Coastal Regulation Zone, 2011-EIA – methods of impact analysis and its process			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

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
3. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering,Scitech Publications (India), Chennai, 2010

Reference Books

1. Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015.
2. Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi, 2013.
3. S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 2018.
4. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Fifth Revision), IRC: 37-2018
5. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2017 .

Web References
1. https://nptel.ac.in/courses/105/101/105101083/
2. https://nptel.ac.in/courses/105105176/
3. https://nptel.ac.in/courses/105/105/105105039/
4. https://nptel.ac.in/courses/105107123/
5. https://nptel.ac.in/courses/114106025/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	-	-	-	2	2	1
2	3	3	3	2	-	-	-	-	-	-	-	1	1	2
3	3	3	3	2	-	-	-	-	-	-	-	3	3	2
4	2	-	2	1	3	-	-	-	-	-	-	2	2	1
5	1	-	-	2	3	-	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus.

Department	**Civil Engineering**	Programme :**B.Tech.**						
Semester	**V**	Course Category Code: **PE**				*End Semester Exam Type: **TE**		
Course Code	**U23CEE510**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Green Building Technology**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	Nil							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand green building principles, history, impacts, and Indian rating systems.	**K2**
	CO2 Identify energy sources, their carbon footprints, and building performance testing methods.	**K2**
	CO3 Recognize energy-efficient materials and technologies, and compare sustainable materials.	**K2**
	CO4 Apply green building design guidelines and conduct cost and life-cycle analysis.	**K3**
	CO5 Familiarize with building codes, legislation, and the IGBC certification process.	**K2**

Unit – I	**Concept of Green buildings**	**Periods:09**	
Definition of Green Buildings - Typical features of green buildings - Necessity, initiatives of green buildings in India - Green building Assessment - Green Building Rating Systems - Energy efficient criteria - Environmental benefits, economic benefits, health and social benefits - Major energy efficiency areas for building - Contribution of buildings towards Global Warming - Life cycle cost of buildings - Codes and Certification Programs			**CO1**
Unit – II	**Sources of energy**	**Periods:09**	
Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources; potential of these sources, hazards, pollution - Global scenario with reference to demand and supply in India - Global efforts to reduce carbon emissions. Carbon emission: Forecasting - Control of carbon emission - Air quality and its monitoring carbon foot print - Environmental issues - Minimizing carbon emission - Energy retrofits and Green Remodels.			**CO2**
Unit – III	**Green building materials, planning and specification**	**Periods:09**	
Green Building Materials: Sustainably managed Materials - Depleting natural resources of building materials - Renewable and Recyclable resources - Energy efficient materials - Green cement - Biodegradable materials - Smart materials - Manufactured Materials - Volatile Organic Compounds (VOC's) - Natural Non-Petroleum Based Materials - Recycled materials - Renewable and Indigenous Building Materials - Engineering evaluation of these materials. Green Building Planning and Specifications: Environment friendly and cost effective Building Technologies - Integrated Life cycle design of Materials and Structures - Energy Conservation Measures in Buildings.			**CO3**
Unit – IV	**Design of Green buildings**	**Periods:09**	
Sustainable sites - Impact of building on environment - Life cycle assessment - Principles of sustainable development in building design - Design on Bioclimatic and solar passive architecture - Considerations of energy consumption, water use and system reliability - Indoor air quality, noise level, comfort and cost efficiency in building design - Advanced Green building technologies and innovations.			**CO4**
Unit – V	**Construction of Green buildings**	**Periods:09**	
Energy efficient construction - Practices for thermal efficiency and natural lighting - Eco- friendly water proofing - ECB codes building rating - Maintenance of green buildings - Cost and Performance Comparisons and Benchmarking - Green Project Management methods and Best Practices - Cost/benefit analysis of green buildings - Life-cycle analysis of greenbuildings - Case studies of rated buildings (new and existing).			**CO5**

Lecture Periods:45	**Tutorial Periods:-**	**Practical Periods:-**	**Total Periods:45**

Text Books

1. Kibert, C.J, "Sustainable Construction: Green Building Design and Delivery". John Willey and Sons, 2016.
2. Edward G Pita, An Energy Approach – Air -conditioning Principles and Systems", Pearson Education, 2018.
3. K.S Jagadish, B. U. Venkataramareddy and K.S. Nanjundarao, "Alternative Building Materials and Technoogies K, New Age International, 2018.

Reference Books

1. Osman Attmann, "Green Architecture Advanced Technologies and Materials". McGraw Hill, 2018.
2. Jerry Yudelson "Green building Through Integrated Design" McGraw Hill, 2018.
3. Lever More G J,"Building Energy Management System", E and FN Spon , London, 2013.

Web References

1. https://nptel.ac.in/courses/105102195/
2. https://www.archdaily.com/tag/case-study-houses
3. https://www.archdaily.com/category/office-buildings

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	2	3	2	3	2	3	3	3
2	3	3	3	3	3	3	2	3	2	3	2	3	3	3
3	3	3	3	3	3	3	2	3	2	3	2	3	3	3
4	3	3	3	3	3	3	2	3	2	3	2	3	3	3
5	3	3	3	3	3	3	2	3	2	3	2	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Professional Elective Courses – III (Offered in Semester VI)

Course Code	Course Title
U23CEE611	Advanced Structural Analysis
U23CEE612	Pollution control and Monitoring
U23CEE613	Building Codes and Requirement
U23CEE614	Traffic engineering and Management
U23CEE615	Urban Planning and Development

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23CEE611**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Advanced Structural Analysis**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	**Structural Analysis**							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the principles of cable structures and the mechanics of suspension bridges.	**K3**
	CO2 Understand the behavior of arches under different loading conditions.	**K3**
	CO3 Understand the behavior of building frames under various loading conditions	**K3**
	CO4 Analyze indeterminate structures using plastic analysis techniques to determine collapse loads and plastic hinges	**K3**
	CO5 Understand fundamentals theory of the Finite Element Method	**K3**

UNIT-I	**Cables and Suspension Bridges**	**Periods: 09**
Components and their Functions - Analysis of cable under concentrated loads and UDL – Shape of cable under self-weight – Anchorage of suspension cables – Bending Moment and Shear Force in three hinged stiffened girders – Max Bending Moment due to single concentrated load and UDL - Influence lines for Bending Moment and Shear Force – Two hinged stiffened girders		**CO1**

UNIT-II	**Arches**	**Periods: 09**
Arches as structural forms –Types of arches – Two hinged and Three hinged parabolic arches with supports at the same and different levels – Determination of normal thrust, radial shear and bending moment.		**CO2**

UNIT-III	**Analysis of Trusses**	**Periods: 09**
Analysis of trusses with internal and external redundancy with maximum one redundant of simply supported and cantilever truss by force method		**CO3**

UNIT-IV	**Plastic Analysis of Structures**	**Periods: 09**
Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems		**CO4**

UNIT-V	**Finite Element Method**	**Periods: 09**
Introduction – Discretization of structure – Step in Finite Element Analysis – Shape function – Classification of Functional Approximation methods – Analysis of one dimensional and two dimensional elements		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Vaidyanathan R and Perumal P, Structural Analysis, Vol. 1 & 2, Laxmi Publications Pvt. Ltd, New Delhi, 2016, 4th Edition
2. Bhavikatti,S.S, Structural Analysis, Vol. 1 & 2, Vikas Publishing House Pvt. Ltd., New Delhi, 2010, 4th Edition
3. B.C.Punmia, Ashok Kumar Jain, Arun K. Jain, "Theory of Structures", Laxmi Publications Pvt. Ltd, 2017, 13th Edition
4. Arun Shyam,Karuna Basker, Structural Analysis, Medtech Publisher, 2019
5. Junuthula Narasimha Reddy, An introduction to the finite element method, McGraw Hill, 1993.

Reference Books

1. Dr.R.P. Rethaliya, Structural Analysis-I, Atul Prakashan Publisher, 2020
2. Dr. Suresh R. Parekar, H.M. Somayya, Structural Analysis- I, Nirali Prakashan Publisher, 2014
3. Wang. C. K., Intermediate Structural Analysis, McGraw Hill Publishing Co., Tokyo, Fourth Edition, 2017.
4. Jindal, R. L., Indeterminate Structural Analysis, S. Chand and Company. New Delhi, 2000.
5. P.Seshu, “Finite Element Analysis”, PHI Learning Private Limited, New Delhi 2012

Web References

1. https://nptel.ac.in/courses/105105166/
2. https://onlinecourses.nptel.ac.in/noc20_ce35/unit?unit=50&lesson=51
3. https://nptel.ac.in/courses/105101085/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	3	2	1	-	-	-	-	-	-	1	3	3
2	3	3	3	2	1	-	-	-	-	-	-	1	3	3
3	3	3	3	2	1	-	-	-	-	-	-	1	3	3
4	3	3	3	2	1	-	-	-	-	-	-	1	3	3
5	3	3	3	2	1	-	-	-	-	-	-	1	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT1	CAT2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus.

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: PE			*End Semester Exam Type: **TE**			
Course Code	**U23CEE612**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Pollution Control and Monitoring**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**Air and Noise Pollution**		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Describe the principles of the biological and chemical treatment processes that are required to ensure adequate quality and quantities of potable water.	**K2**
	CO2	Analyze the sources, effect of air pollution, air quality monitoring and control system.	**K3**
	CO3	Use advanced methods for monitoring and modeling for noise pollution and preventive temporal patterns for noise pollution.	**K3**
	CO4	Understand the generation and preventive measures of solid waste.	**K2**
	CO5	Analyze the method of sanitation for various field	**K3**

UNIT – I	**WATER POLLUTION & CONTROL**	**Periods: 09**	
Natural process-pollution due to industrial, agricultural and municipal wastes-limitations of disposal by dilution-BOD consideration in streams – Oxygen Sag Curve-Water pollution control legislation.			**CO1**
UNIT – II	**AIR POLLUTION AND CONTROL**	**Periods: 09**	
Pollution and their sources-effects of pollution on human health, vegetation and climate-prevention and control of particulate-industry and air-pollution surveys and sampling-Air quality monitoring- air pollution control legislation			**CO2**
UNIT – III	**NOISE POLLUTION AND CONTROL**	**Periods: 09**	
Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution; fundamentals of sound generation, propagation etc; sound measurement; sound level meters – types, components, Measures for prevention and control of noise; environmental and industrial noise; noise control legislation.			**CO3**
UNIT – IV	**SOLID WASTE MANAGEMENT**	**Periods: 09**	
Source characteristics – quantities – collection methods and disposal techniques – sanitary landfill – incineration – and pyrolysis, composting, aerobic and anaerobic- economics of composting; recycling and reuse.			**CO4**
UNIT – V	**ENVIRONMENTAL SANITATION**	**Periods: 09**	
Relation of food to disease-principles of food sanitation-sanitation of kitchens, restaurants and other catering establishments-quality changes in milk-milk as carrier of infection-pasteurization of milk-HTST and LTLT processes – cattle shed sanitation. Orientation of buildings with respect to the direction of prevailing winds and solar movement. Air movement inside the buildings for a healthy residential environment.			**CO5**

Lecture Periods:45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Noel de Nevers, “Air Pollution Control Engineering”, Waveland press,Inc 2017.
2. S. M. Khopkar “Environmental Pollution Monitoring and Control”,New age international(P)Limited 2004
3. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, “Air Pollution Control Engineering”, Tokyo, springer science + science media LLC,2004.

Reference Books

1. Vesilind (1997), Introducing to Environmental Engineering, PWS Publishing Company.
2. Gerard Kiley (1997), Environmental Engineering, Irwin McGraw-Hill.
3. Rao C.S. (1996), Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi.
4. Ahmed El-Nemr, 2010, Impact, Monitoring and Management of Environmental Pollution.
5. Marquita K. Hill,2010 Understanding Environmental Pollution

Web References
1. https://nptel.ac.in/courses/105102089/
2. http://www.ilocis.org/documents/chpt55e.htm
3. https://nptel.ac.in/courses/105/102/105102089

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	3	3	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3	1	3
CO3	3	3	3	3	-	-	-	-	-	-	-	3	2	3
CO4	2	3	3	3	-	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	-	-	-	-	-	-	-	3	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT1	CAT2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus.

`Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: PE			End Semester Exam Type: **TE**			
Course Code	**U23CEE613**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Building Codes and Requirement**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	Building Materials, Basic of Civil Engineering		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand importance of National Building Code	**K2**
	CO2	Learn various building requirement for building codes	**K2**
	CO3	Identify various fire and safety related codal requirements	**K3**
	CO4	Become aware of different codes related to various building services	**K2**
	CO5	Familiarize the various building bylaws used in building drawings	**K2**

UNIT – I	**INTRODUCTION TO NATIONAL BUILDING CODE**	**Periods: 09**	
Scope and Terminologies, Administration. Historical background and need for codes and bye laws for buildings and land use development in urban context. Building Permit and Inspection			**CO1**
UNIT – II	**GENERAL BUILDING REQUIREMENTS**	**Periods: 09**	
Land Use classification, Classification of Buildings, Area and Height Limitations, Requirements of various parts of Building.			**CO2**
UNIT – III	**FIRE AND SAFETY**	**Periods: 09**	
Fire prevention, life safety, Design and Construction-: construction practices and safety, Earth quake resistant of masonry wall, Wind load design.			**CO3**
UNIT – IV	**BUILDING SERVICES**	**Periods: 09**	
Plumbing, Lighting and ventilation, Acoustics, Sound Insulation and Heat Insulation in buildings. National Building Code and provisions related to general building requirements, fire and life safety, lighting and ventilation, MEP, acoustics, vertical circulation, sustainability etc.; Energy Conservation Building Code.			**CO4**
UNIT – V	**BUILDING BYLAWS**	**Periods: 09**	
Overview of various development regulations, building bye laws, architectural controls; Study of Building Bye laws/regulations of selected cities with emphasis on zoning, architectural controls, frame controls etc. Requirements of statutory drawings- submission drawings, as built drawings, completion drawings			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. "Building Construction Handbook" by Roy Chudley and Roger Greeno. Publisher: Routledge
2. “Handbook on Building Bye-Laws" by National Building Organisation. Publisher: Ministry of Housing & Urban Poverty Alleviation, Government of India.

Reference Books

1. National Building Code of India 2005
2. SP 64 (2001), SP 7 (2005), Bureau of Indian Standards
3. National Building Code 2005
4. Energy Conservation Building Code (ECBC) 2007
5. Building Byelaws of different cities of India

Web References

1. https://www.irc.nic.in/
2. https://www.bis.gov.in/standards/technical-department/national-building-code/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	-	-	-	2	2	1
2	3	3	3	2	-	-	-	-	-	-	-	1	1	2
3	3	3	3	2	-	-	-	-	-	-	-	3	3	2
4	2	-	2	1	3	-	-	-	-	-	-	2	2	1
5	1	-	-	2	3	-	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**VI**			Course Category Code: **PE**		End Semester Exam Type: **TE**		
Course Code	**U23CEE614**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Traffic Engineering and Management**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	Transportation Engineering							

Course Outcome			BT Mapping (Highest Level)
	On completion of the course, the students will be able to		
	CO1	Analyze vehicle and driver characteristics, road conditions, and control mechanisms to design effective and safe transportation systems.	**K3**
	CO2	Apply principles of road cross-section design, curvature, and traffic flow analysis to optimize highway and road infrastructure.	**K2**
	CO3	Design and optimize traffic signal systems, including intersections, interchanges, and roundabouts, to improve traffic management and safety.	**K3**
	CO4	Implement traffic regulation strategies, parking management, and control measures to enhance road safety and efficiency.	**K3**
	CO5	Develop and evaluate traffic safety measures, legislation, and infrastructure improvements to reduce accidents and improve overall traffic management.	**K2**

UNIT – I	**ELEMENTS OF TRANSPORTATION ENGINEERING**	**Periods:09**	
Vehicle characteristics like weight , size, turning radius, concept of design vehicle. Human and Driver characteristics – PIEVE theory, comfort, concept of design driver. Road characteristics – surface conditions, slopes and curves. Control mechanisms. Terminal facilities.			**CO1**
UNIT – II	**HIGHWAY GEOMETRIC DESIGN**	**Periods:09**	
Introduction, road cross section parameters. Horizontal curves, vertical curves, channelization design. Fundamentals of traffic flow, uninterrupted traffic flow, Interrupted traffic flow, speed studies and analysis, Highway capacity studies and analysis,			**CO2**
UNIT – III	**TRAFFIC SIGNAL**	**Periods:09**	
Fixed and vehicle actuated signals - Optimum cycle length - Warrants for signals - Saturation flow - Signal co-ordination - Area traffic control - Design of signalized and un-signalized intersections. Design of interchanges, Design of roundabouts. Road signs- test of the sign. Lettering and placement of signals.			**CO3**
UNIT – IV	**TRAFFIC REGULATION AND SAFETY**	**Periods:09**	
Regulation of speed - Vehicle and road users – Parking regulations - Parking and Traffic Control : Parking studies - Design of parking lots – Traffic signs - Road markings at different locations - Speed breaker Accident investigation - Accident data analysis.			**CO4**
UNIT – V	**TRAFFIC MANAGEMENT**	**Periods:09**	
Legislation enforcement and education for traffic safety, Cost of road accidents, Measures for accident reduction Segregation of traffic, Tidal flow operation, Exclusive bus lane, oneway streets, Street lighting, Noise barrier.			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2015.
2. S C Saxena and S P Arora, “A Textbook of Railway Engineering”, Dhanpat Rai Publication, 2010.

Reference Books

1. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2019.
2. Rangwala, “Airport Engineering”, Charotar Publishing House, 2018.
3. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Fifth Revision), IRC: 37-2018
4. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2017

Web References
1. http://www.yorku.ca/yaoguo/tranportation1025/
2. http://www. tranportation.cum.edu/~wn0g/2ch6a.pdf
3. https://nptel.ac.in/courses/105101087/
4. https://nptel.ac.in/courses/105107123/
5. https://nptel.ac.in/courses/114106025/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	-	-	-	-	-	2	2	1
2	3	3	3	2	-	-	-	-	-	-	-	1	1	2
3	3	3	3	2	-	-	-	-	-	-	-	3	3	2
4	2	-	2	1	3	-	-	-	-	-	-	2	2	1
5	1	-	-	2	3	-	-	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CEE615**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Urban Planning and Development**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	Transportation Engineering		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Describe basic issues in urban planning	**K2**
	CO2	Get knowledge on bearing capacity and testing methods.	**K2**
	CO3	Formulate plans for urban and rural development	**K3**
	CO4	Determine the load carrying capacity of pile foundation**.**	**K3**
	CO5	Plan and analyse socio economic aspects of urban and rural planning**.**	**K3**

UNIT – I	**BASIC ISSUES**	**Periods:09**	
Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, Peri-urban areas, Central Business District (CBD), Classification of urban areas – Trend of Urbanisation at International, National, Regional and State level.			**CO1**
UNIT – II	**PLANNING PROCESS**	**Periods:09**	
Principles of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objectives, Delineation of Planning Areas, Surveys and Questionnaire Design.			**CO2**
UNIT – III	**DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION**	**Periods:09**	
Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights, Special Economic Zones- Development of small town and smart cities-case studies			**CO3**
UNIT – IV	**PLANNING AND DESIGN OF URBAN DEVELOPMENT PROJECTS**	**Periods:09**	
Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects.			**CO4**
UNIT – V	**LEGISLATION, DEVELOPMENTAND MANAGEMENT OF URBAN SYSTEM**	**Periods:09**	
Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries.			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Goel, S.L “Urban Development and Management”, Deep and Deep publications, New Delhi,2002
2. Singh V.B, “Revitalised Urban Administration in India”, Kalpaz publication, Delhi, 2001
3. Edwin S.Mills and Charles M.Becker, “Studies in Urban development”, A World Bank publication, 1986

Reference Books

1. “Tamil Nadu Town and Country Planning Act 1971”, Government of Tamil Nadu,Chennai.
2. Goel S.L., “Urban Development and Management”, Deep and Deep Publications, New Delhi,2002.
3. Thooyavan, K.R., Human Settlements – “A Planning Guide to Beginners”, M.A Publications, Chennai, 2005

Web References

1. https://archive.nptel.ac.in/courses/124/107/124107158/
2. https:// nptel.ac.in/courses/124105016
3. https://archive.nptel.ac.in/courses/124/105/124105163/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	2	1	2	2	1	2	-	-	-	-	-	3	3	2
2	2	1	2	2	1	2	1	-	-	-	-	3	2	3
3	2	3	3	2	2	3	1	-	-	-	-	3	2	3
4	2	3	3	2	2	3	1	-	-	-	-	2	2	2
5	2	3	3	2	2	3	1	-	-	-	-	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Professional Elective - IV

Department	**Civil Engineering**	Programme :**B.Tech.**						
Semester	**VII**	Course Category Code: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CEE716**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Structural Health Monitoring**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite		
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Able to model the structure to understand the behaviour	**K4**
	CO2 Understanding the type of sensors and its data acquisition system	**K4**
	CO3 Understanding the structural monitoring system for the condition assessment	**K4**
	CO4 Analyse the data procured and its interpretation	**K4**
	CO5 Able to conduct investigations to both new and aged structures	**K4**

UNIT- I	**STRUCTURAL MODELLING AND FINITE ELEMENT MODELS**	**Periods: 09**
Review of Structural Modelling and Finite Element Models: Modelling for damage and collapse behaviour of structures, finite element modelling, theoretical prediction of structural failures.		**CO1**
UNIT- II	**SIGNALS, SYSTEMS, SENSORS AND DATA ACQUISITION SYSTEMS**	**Periods: 09**
Review of Signals, Systems and Data Acquisition Systems: Frequency and time domain representation of systems, Fourier/Laplace transforms, modelling from frequency response measurements, D/A and A/D converters, programming methods for data acquisition systems. Sensors for Health Monitoring Systems: Acoustic emission sensors, ultrasonic sensors, piezo ceramic sensors and actuators, fibre optic sensors and laser stereography techniques, imaging techniques.		**CO2**
UNIT - III	**MONITORING SYSTEMS**	**Periods: 09**
Health Monitoring/Diagnostic Techniques: Vibration signature analysis, modal analysis, neural network-based classification techniques. Integrated Health Monitoring Systems: Intelligent Health Monitoring Techniques, Neural network classification techniques, extraction of features from measurements, training and simulation techniques, and connectionist algorithms for anomaly detection, multiple damage detection, and case studies.		**CO3**
UNIT - IV	**INFORMATION TECHNOLOGY FOR HEALTH MONITORING**	**Periods: 09**
Information Technology for Health Monitoring: Information gathering, signal analysis, information storage, archival, retrieval, security; wireless communication, telemetry, real time remote monitoring, network protocols, data analysis and interpretation.		**CO4**
UNIT - V	**PROJECT BASED HEALTH MONITORING TECHNIQUES**	**Periods:09**
Project Based Health Monitoring Techniques: Health monitoring techniques based on case studies, practical aspects of testing large bridges for structural assessment, optimal placement of sensors, structural integrity of aging multistory buildings, condition monitoring of other types of structures		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Structural Health Monitoring – Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes.
2. Health Monitoring of Structural Materials and Components – Douglas E. Adams.
3. Structural Health Monitoring: An Overview – Charles R. Farrar & Keith Worden.

Reference Books

1. Philip W., Industrial sensors and applications for condition monitoring, MEP, 1994.
2. Armer G.S.T (Editor), Monitoring and assessment of structures, Spon, London, 2001
3. Wu, Z.S. (Editor), Structured health monitoring and intelligent infrastructure, Vols. 1 & 2, Balkema, 2003.

4. Harris C.M., Shock vibration handbook, McGraw-Hill, 2000.
5. Rao J.S., Vibratory condition monitoring of machines, Narosa Publishing House, India, 2000

Web References

1.https://www.nde-ed.org
2.https://www.nist.gov
3.https://www.techno-press.org/?journal=sss

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	1	2	-	3	-	1	-	-	-	-	1	2	-	2
2	1	2	-	3	-	1	-	-	-	-	1	2	-	2
3	1	2	-	3	-	1	-	-	-	-	1	2	-	2
4	1	2	-	3	-	1	-	-	-	-	1	2	-	2
5	1	2	-	3	-	1	-	-	-	-	1	2	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**		Programme :**B.Tech.**					
Semester	**VII**		Course Category Code: **PE**			End Semester Exam Type: **TE**		
Course Code	**U23CEE716**		Periods/Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Municipal Solid Waste Management**		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite								
Course Outcomes	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)
	CO1	Understand the nature and characteristics of municipal solid wastes.						**K4**
	CO2	Understand the concept of reduction, reuse and recycling of waste.						**K2**
	CO3	Plan and design systems for storage, collection, transport, processing and disposal of municipal solid Waste						**K3**
	CO4	Understand the issues on solid waste management from an integrated source						**K4**
	CO5	Design and operate sanitary landfill						**K3**

UNIT- I	**SOURCES AND CHARACTERISTICS**	**Periods: 09**
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 –functional Elements of solid waste management – Requirements and salient features of Solid waste management rules (2016) -Role of public and NGO"s- Public Private participation – Elements of integrated Municipal Solid Waste Management Plan.		**CO1**
UNIT- II	**SOURCE REDUCTION, WASTE STORAGE AND RECYCLING**	**Periods: 09**
Waste Management Hierarchy –3R-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.		**CO2**
UNIT - III	**COLLECTION AND TRANSFER OF WASTES**	**Periods: 09**
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..		**CO3**
UNIT - IV	**PROCESSING OF WASTES**	**Periods: 09**
Objective(s) of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste -composting and biomethanation; Thermal processing options – case studies under Indian conditions.		**CO4**
UNIT - V	**WASTE DISPOSAL**	**Periods:09**
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.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. William A. Worrell, P. AarneVesilind (2012) Solid Waste Engineering, Cengage Learning, 2012.
2. John Pitchel (2014), Waste Management Practices-Municipal, Hazardous and industrial – CRC Press,Taylor and Francis, New York.
3. George Tchobanoglouset.al., “Integrated Solid Waste Management”, McGraw-Hill Publishers, 1993.
4. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, “Waste Management”, Springer, 1994.

Reference Books
1. CPHEEO (2014), “Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization. Government of India, New Delhi.
2. George Tchobanoglous and FrankKreith (2002).Handbook of Solid waste management, McGraw Hill, New York.
3. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
4. R.E.Landreth and P.A.Rebers, “Municipal Solid Wastes – problems and Solutions”, Lewis Publishers, 1997.
5. CPHEEO (2014), “Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization. Government of India, New Delhi.

Web References
https://nptel.ac.in/courses/120108005/
http://cpheeo.gov.in/upload/uploadfiles/files/Part1
https://nptel.ac.in/content/storage2/courses/104103022

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	1	2	2	3	3	3	3	3	3	2	3	3	3	2
2	3	3	2	3	3	3	3	2	3	2	2	3	3	3
3	3	3	3	2	2	2	3	3	3	3	2	3	3	2
4	2	3	2	3	2	3	2	3	3	2	2	3	3	3
5	3	3	3	2	3	3	3	3	3	2	3	3	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PE**				*End Semester Exam Type: **TE**		
Course Code	**U23CEE718**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Quality Control and Assurance in Construction**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**-Nil-**		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Achieve the knowledge of quality management guidelines, and quality circles.	**K2**
	CO2	Apply the quality standards for preparing Quality system documents.	**K2**
	CO3	Explain the skill of preparing inspection procedures for quality planning.	**K2**
	CO4	Select the techniques and tools for Quality Assurance and Control in Construction Industry.	**K2**
	CO5	Achieve knowledge of quality improvement techniques	**K2**

UNIT-I	**QUALITY MANAGEMENT**	**Periods: 09**	
Introduction – Definitions and objectives – Dimensions of quality - Factors influencing construction quality – Responsibilities and authority – Methods to improve quality – Quality Process - Quality plan – Quality Management Guidelines – Quality circles.			**CO1**
UNIT-II	**QUALITY SYSTEMS**	**Periods: 09**	
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 – Emission Norms – BS Norms.			**CO2**
UNIT-III	**QUALITY PLANNING**	**Periods: 09**	
Quality Policy, Objectives and methods in the Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – Taguchi's concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures - Processes and products – Total QA / QC programme and cost implication			**CO3**
UNIT-IV	**QUALITY ASSURANCE AND CONTROL**	**Periods: 09**	
Objectives – Regularity agent, owner, design, contract, and construction-oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals – 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			**CO4**
UNIT-V	**QUALITY IMPROVEMENT TECHNIQUES**	**Periods: 09**	
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 – Value engineering and value analysis			**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Hutchins. G, ISO 9000: A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification, Viva Books Pvt. Ltd., 1994.
2. James, J.O' Brian, Construction Inspection Handbook – Total Quality Management, Van Nostrand, 1997
3. KB Rajoria, Deepak Naryan, Deepak Gupta, ISO 9000 Practices in construction, CBS Publishers & Distributors Pvt. Ltd., ISBN:978-93-90709-33-5, 2021.

Reference Books

1. John L. Ashford, The Management of Quality in Construction, E & F.N.Spon, 1989.
2. Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, McGraw Hill, 2001
3. Steven McCabe, Quality Improvement Techniques in Construction, Addison Wesley Longman Ltd, 1998

Web References

1. https://www.msajce-edu.in/academics/civil/LectureNote/GE8077-LN.pdf
2. https://www.slideshare.net/kumudajayaram/iso-9000-87352949
3. https://docs.builderscollege.edu.in/Downloads/naac/ssr/C1/1.3.2_mecem_2019_20.pdf

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	2	1	1	-	-	-	-	-	-	-	-	3	2	2
2	2	2	1	-	-	-	-	-	-	-	-	2	2	2
3	1	2	1	-	-	-	-	-	-	-	-	1	2	2
4	2	2	3	-	-	-	-	-	-	-	-	3	2	2
5	1	2	1	-	-	-	-	-	-	-	-	1	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application-oriented / Problem-solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: EE				*End Semester Exam Type: TE		
Course Code	**U23CEE719**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Tunnelling Engineering**	**3**	**0**	**0**	**3**	**25**	75	100
Prerequisite								

Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Describe the different types of underground structures and their applications	**K2**
	CO2	Identify the excavation methods for construction of underground structures in different In – situ conditions	**K2**
	CO3	Analyze the underground structures in rock and soil using elastic and elastoplastic stress–strain behavior of rock and soil	**K2**
	CO4	Design the underground structure using empirical, analytical and numerical approaches	**K2**
	CO5	Solve underground problems by using codes and standards	**K2**

UNIT-I	**Introduction**	**Periods: 06**	
Types and classification of underground openings, Factors affecting design, Design methodology, Functional aspects - Size and shapes, Support systems, Codal provisions			**CO1**
UNIT-II	**Excavation Methods**	**Periods: 08**	
Principles of rock breakage, Excavation methods, Blasting - types of explosives, blast hole design, Drilling methods and machines, Blast hole timing, TBM tunneling, Factors influencing and evaluation, Excavation mechanics, Geological considerations, Safety provisions			**CO2**
UNIT-III	**Case Studies**	**Periods: 07**	
Tunnels, Energy storage caverns, Nuclear waste disposal repositories, Metros, Underground chambers and defense installations			**CO3**
UNIT-IV	**Analysis**	**Periods: 12**	
Stresses and deformations around openings, Stresses and deformations around tunnels and galleries with composite lining due to internal pressure, Closed form solutions			**CO4**
UNIT-V	**Design**	**Periods: 12**	
Design based on analytical methods, Empirical methods based on RSR, RMR, Q systems, Design based on Rock support interaction analysis, Observational method- NATM, Stability of excavation face and Tunnel portals. Use of appropriate software package			**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Saxena, S.C., (Year) Tunneling and Tunnel Engineering, Dhanpat Rai Publications, New Delhi.
2. Chapman, D., Metje, N., and Stark, T., (2010) Introduction to Tunnel Construction, CRC Press, Taylor & Francis Group, London.
3. Das, B.N., (Year) Handbook on Tunnels and Underground Works, New Age International Publishers, New Delhi.
4. Verma, B.S., (Year) Rock Mechanics and Tunnelling Techniques, Khanna Publishers, New Delhi.
5. Bickel, J.O., and Kuesel, T.R., (1996) Tunnel Engineering Handbook, Springer, New York.
6. Sharma, A.K., (Year) Tunnel Engineering, CBS Publishers & Distributors, New Delhi.

Reference Books

1. Zhao, J., and Shirlaw, J.N., (Year) Modern Tunneling Science and Technology, World Scientific Publishing, Singapore.
2. Golser, M., (Year) Construction Methods in Tunnel Engineering, Ernst & Sohn, Germany.
3. Hoek, E., and Brown, E.T., (1980) Underground Excavations in Rock, Institution of Mining and Metallurgy, London.
4. Kirkland, C., (Year) The History of Tunneling and Underground Construction, ICE Publishing, London.

Web References

1. https://nptel.ac.in/courses/105/106/105106232/
2. https://ocw.mit.edu/courses/civil-and-environmental-engineering/
3. https://ocw.tudelft.nl/courses/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	1	1	2	1	1	1	2	1	1	1	1	1	1	2
2	2	2	2	2	1	1	2	2	2	2	2	2	2	2
3	3	3	2	2	2	1	2	2	2	2	1	2	2	2
4	3	3	2	2	3	2	2	3	3	3	3	3	3	3
5	3	3	3	2	3	2	3	3	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application-oriented / Problem-solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PE**				*End Semester Exam Type: **TE**		
Course Code	**U23CEE719**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Architecture and Town Planning**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite		
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the history and architectural developments	**K2**
	CO2 Comprehend the past, follows present, ascendance the future	**K2**
	CO3 Design interior building services	**K3**
	CO4 Understand and plan for site development	**K3**
	CO5 Plan and design sustainable cities and town	**K3**

UNIT-I	**ARCHITECTURE AND ITS DEVELOPMENT**	**Periods: 09**
Indian Indus valley, Vedic, Buddhist, Indo-Aryan, Dravidian and Mughal periods; European Egyptian, Greek, Roman, medieval and renaissance periods- construction and architectural styles; vernacular and traditional architecture. Architectural developments and impacts on society since industrial revolution; influence of modern art on architecture.		**CO1**
UNIT-II	**SKILLS FOR AN ARCHITECTURAL UNDERSTANDING**	**Periods: 09**
Understanding the construction methods and materials through study of Egyptian, Greek, Roman, European, Indian Architectural History - Modern Architecture Thinking & Analytical Skills - Empathy - Philosophical Understanding from Idea to Form - Psychological and Social Understanding.		**CO2**
UNIT-III	**BUILDING SERVICES**	**Periods: 09**
Water supply, sewerage and drainage systems; sanitary fittings and fixtures; plumbing systems, principles of internal & external drainage systems, principles of electrification of buildings, intelligent buildings; elevators & escalators, their standards and uses; air-conditioning systems; firefighting systems, building safety and security systems		**CO3**
UNIT-IV	**TOWN PLANNING**	**Periods: 09**
Objectives and Principles of Town Planning, Stages of Town Development (Indian), Levels of planning, Different types of plan, land use planning, Zoning – Principles, advantages, classification. Planning ideologies - Drainage and water supply in the selection of site for the development – Residential – Commercial – Industrial – Public – Transportation, Utility and services – Agriculture		**CO4**
UNIT-V	**CITY, HOUSING AND LANDSCAPE PLANNING**	**Periods: 09**
Evolution of cities; principles of city planning; types of cities & new towns; planning regulations and building byelaws; eco-city concept; sustainable development. Concept of housing; neighbourhood concept; Principles of landscape design and site planning; environmental considerations in landscape planning.		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. De Charia & Callender, Architecture, Mc. Graw Hill, (2012).
2. Vaishali S. Limaye, Rajani Deshmukh, Supriya.B, Architecture and Town Planning, Nirali Prakashan Publication, Edition 2016
3. Satish Chandra Agarwal, Architecture and Town Planning,
4. Dhanpat Rai & Co. Edition 2014.
5. Sajjan V.Wagh, Pravin R.Minde, Architecture and Town Planning, Tech –Max Publications, Pune, Edition 2016.
6. V.S.Limaye, A.D.Pawar, Architectural Planning And Design Of Buildings, Nirali Prakashan Publication, Edition 2016

Reference Books

1. Gallion, Urban pattern City planning and design, Charotar Publishing House, (2010).
2. Modak & Ambedkar, Town and Country Planning and Housing, (2001).

3. Arian Mostaedi, 'Sustainable Architecture: Low Tech Houses', CarlesBroto,2002

Web References

1. https://archive.nptel.ac.in/courses/124/107/124107158/
2. https://archive.nptel.ac.in/courses/124/105/124105016/
3. https://onlinecourses.swayam2.ac.in/cec20_ar01/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	SPO2	PSO3
1	-	-	-	-	-	2	2	-	-	-	3	3	1	2
2	-	-	-	1	1	2	1	1	-	-	2	3	1	-
3	2	2	2	1	2	2	1	-	-	1	2	2	3	-
4	1	1	1	1	2	2	2	1	-	-	2	2	2	3
5	3	2	2	-	2	2	1	-	-	1	3	1	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application-oriented / Problem-solving / Design / Analytical in content beyond the syllabus

Professional Elective - V

Department	**Civil Engineering**		Programme : **B.Tech.**					
Semester	**VIII**		Course Category Code: **PE**			End Semester Exam Type: **TE**		
Course Code	**U23CEE821**		Periods/Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Precast Structures**		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	**Structural Analysis, Design of RC Elements**								
Course Outcomes	**On completion of the course, the students will be able to**								BT Mapping (Highest Level)
	CO1	Understand the differences, advantages, and limitations of precast vs conventional construction methods.							**K4**
	CO2	Identify and classify major precast elements, their types, applications, and erection processes.							**K4**
	CO3	Analyze and select appropriate precast structural systems for various building types.							**K4**
	CO4	Gain knowledge of precast production, storage, handling, and logistics processes, ensuring quality control.							**K4**
	CO5	Design joints and connections for load transfer and apply safe handling and erection methods.							**K4**
UNIT- I	**Introduction to Precast**							**Periods: 09**	
Introduction – current scenario and constraints, the difference between precast vs conventional construction methods, needs, types, features, Advantages (for owners, architects, engineers, contractors, end users) and Limitations, Residential, Commercial & Industrial Applications of precast, Materials used, Code provisions and clauses.									**CO 1**
UNIT- II	**Precast Elements**							**Periods: 09**	
Major elements (Beam, slab, wall, column, foundation, staircase, roof elements, façade) : Classification, Types and shapes, selection, application, erection, advantages, Infra works -Pipes & drains, duct bank, baggage handling tunnel, culvert and sleeper, facia element, pavement and channel.									**CO 2**
UNIT - III	**Precast Structural Systems**							**Periods: 09**	
Structural System: Skeletal System, Portal Frame system, Large Panel system, Cell Block system and hollow block system, Guide lines of selection – Residential & office buildings, Industrial Buildings, Commercial buildings, Structural Stability and Structural Behaviour.									**CO 3**
UNIT - IV	**Precast Production, Storage, & Logistics**							**Periods: 09**	
Plant and Production: Introduction -Types & Process, Production – Design and shop drawings, check lists, Moulding, Casting and its types, Concreting, Curing, Demoulding and inspection. Storage, Delivery, Handling- introduction and types of equipment, lifting devices, Erection and installation - Horizontal components, vertical components, special elements, Quality Inspection and Tolerance									**CO 4**
UNIT - V	**Connections, Handling & Erection**							**Periods: 09**	
Design of joints and connections for load transfer. Lifting, transportation, and site erection methods. Stability, tolerances, and alignment issues. Safety regulations during handling and installation.									**CO 5**
Lecture Periods: 45		**Tutorial Periods: -**			**Practical Periods: -**			**Total Periods: 45**	

Text Books

1. Elliott, Kim S. – “Precast Concrete Structures”, Butterworth-Heinemann, 2016

2.Nawy, Edward G. – “Prestressed Concrete A Fundamental Approach”, Prentice Hall, 2010.

3.Muthu, K. U., Vijayanand, S., Iyer, N. R., & Sasidhar, C. – “Basic Structural Analysis & Design of Buildings Using Staad Pro”, I.K. International Publishing, 2018.

Reference Books

1. Precast/Prestressed Concrete Institute (PCI) – PCI Design Handbook (8th Edition, 2017)
2. Ghali, A., Favre, R., & Elbadry, M. – Concrete Structures: Stresses and Deformations (CRC Press, 2011)
3. Moskvin, V. A. – Precast Concrete Structures (Mir Publishers, 1980)

Web References

1. https://bmtpc.org/DataFiles/CMS/file/PDF_Files/61_PAC_Urbaanic_Final.pdf
2. https://www.researchgate.net/publication/383095334_Precast_Concrete_Building_Construction_In_India
3. https://archive.nptel.ac.in/courses/105/105/105105105/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	2	2	3	2	2	3	2	2	3	1	2	3	2
2	3	2	2	3	2	2	3	2	2	3	1	2	3	2
3	3	2	2	3	2	2	3	2	2	3	1	2	3	2
4	3	2	2	3	2	2	3	2	2	3	1	2	3	2
5	3	2	2	3	2	2	3	2	2	3	1	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme : **B.Tech.**						
Semester	**VIII**	Course Category Code: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CEE822**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Industrial Waste Disposal and Treatment**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**Structural Analysis, Design of RC Elements**	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 An ability to use the recent techniques.	**K3**
	CO2 Describe the importance of Pretreatment Methods	**K3**
	CO3 Apply the various techniques for Treatment Methods of Industrial Wastes	**K3**
	CO4 Describe the solve problems related to Industrial Waste Water management and Disposal	**K3**
	CO5 Carry out Industry and power plants studies case studies	**K3**

UNIT- I	**PRECIPITATION**	**Periods: 09**
Uses of water by Industry - Sources and types of wastewaters, quality criteria, effluent standards- Individual and common effluent treatment plants - Population equivalent, Effects of industrial wastes on streams, land, air and waste water treatment plants		**CO 1**
UNIT- II	**PRETREATMENT METHODS**	**Periods: 09**
Pretreatment Methods: Process modification – methods and materials changes – Reduce, reuse and recycle methods, housekeeping etc. to reduce waste discharge and strength of the waste and established methods for by products recovery within the plant operations		**CO 2**
UNIT - III	**TREATMENT METHODS OF INDUSTRIAL WASTES**	**Periods: 09**
Equalization – Neutralization - Oil separation – Floatation – Precipitation –Adsorption - Aerobic and anaerobic biological treatment - High-rate reactors. Chemical oxidation – Ozonation –Ion Exchange – Membrane technologies..		**CO 3**
UNIT - IV	**TREATMENT METHODS OF RESIDUALS**	**Periods: 09**
Residuals of Industrial waste treatment – Characteristics of sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge.		**CO 4**
UNIT - V	**CASE STUDIES**	**Periods: 09**
Industry and power plants - manufacturing process description - wastewater characteristics and waste treatment flow sheet for typical industries – Textiles – Tanneries – Pulp and Paper –Metal finishing – Petroleum refining – Chemical industries - Sugar and distilleries –Dairy –Iron and Steel- Fertilizers –Nuclear power plants		**CO 5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Eckenfelder. W.W., Industrial Water Pollution Control, McGraw Hill, 2017.
2. Arceivala.S.J. Wastewater Treatment for Pollution Control, Tata Mc.Graw Hill. 2018
3. Santosh kumar Garg, Industrial Waste Disposal and Treatment, Khanna Publishers, 2018.

Reference Books

1. Nemerow,N.L., Theories and Practices of Industrial Wastes Treatment, Addisson and Wesley, 2015.
2. Gurnham,C.F., Principles of Industrial Waste Treatment, John Wiley, New York,2012.
3. Varshney, R.S., Industrial Waste Disposal and Treatment,, Nem Chand & Bros., 2017.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	2	2	1	3	2	-	-	-	-	-	1	3	1	2
CO2	2	3	1	2	2	-	-	-	-	-	1	3	1	-
CO3	3	3	3	2	2	-	-	-	-	-	1	2	3	-
CO4	3	3	2	2	3	-	-	-	-	-	1	2	2	3
CO5	3	3	2	2	3	-	-	-	-	-	1	1	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**		Programme :**B.Tech.**					
Semester	**VIII**		Course Category Code: **PE**			End Semester Exam Type: **TE**		
Course Code	**U23CEE823**		Periods/Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**CONSTRUCTION SAFETY**		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite									
Course Outcomes	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)	
	CO1	Understand the fundamentals, codes of practice and bridge failures.						**K4**	
	CO2	Understand the estimation of forces for the design bridge structural elements						**K4**	
	CO3	Design of the slab and girder beam bridges using appropriate method						**K4**	
	CO4	Understand the design principles of long span bridges						**K4**	
	CO5	Understand the design of substructure components e to model the structure to understand the behaviour						**K4**	

UNIT- I	**INTRODUCTION TO CONSTRUCTION SAFETY**	**Periods: 09**
Importance of safety in construction-Common hazards and risks in construction- Safety laws, regulations, and standards (OSHA, BIS, NBC)- Roles and responsibilities of stakeholders in construction safety- Case studies on construction accidents and lessons learned.		**CO 1**
UNIT- II	**HAZARD IDENTIFICATION AND RISK ASSESSMENT**	**Periods: 09**
Types of hazards in construction (physical, chemical, biological, ergonomic)-Hazard identification techniques (HAZOP, FMEA, JSA)-Risk assessment methods (qualitative & quantitative)-Safety audits and inspections-Control measures and mitigation strategies.		**CO 2**
UNIT - III	**SAFETY MANAGEMENT AND ACCIDENT PREVENTION**	**Periods: 09**
Safety management systems (SMS) and their implementation-Accident causation theories (Domino theory, Human Factors theory)-Personal protective equipment (PPE) and safety gear-Emergency response planning and first aid in construction sites-Behavioral safety and safety culture in construction.		**CO 3**
UNIT - IV	**TECHNOLOGY & ADVANCEMENTS IN CONSTRUCTION SAFETY**	**Periods: 09**
Role of automation and robotics in construction safety-IoT, AI, and wearables for real-time safety monitoring-Drones for site safety inspection-Digital safety reporting and documentation-Case studies on technology-driven safety improvements.		**CO 4**
UNIT - V	**PROJECT-BASED SAFETY PRACTICES & CASE STUDIES**	**Periods:09**
Safety practices in high-rise buildings, tunnels, and bridges-Fire safety in construction projects-Site-specific safety planning and execution-Best practices for contractor and laborer safety-Real-world case studies on successful safety implementations.		**CO 5**

Lecture Periods: 45	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. Construction Safety Management and Engineering – David L. Goetsch.
2. Construction Safety Handbook – V.J. Davies & K. Tomasin.
3. Occupational Safety and Health in Construction – OSHA Publications

Reference Books

1. Construction Safety and Health – Richard J. Coble *Covers safety management, risk analysis, and accident prevention techniques in construction.*
2. Construction Safety Management and Engineering – David L. Goetsch *Provides in-depth knowledge of construction safety regulations, hazard identification, and safety management.*
3. Construction Site Safety: A Guide for Managing Contractors – Richard D. Hislop *Focuses on contractor safety management, compliance, and risk mitigation.*

4. Handbook of OSHA Construction Safety and Health– Charles D. Reese *Explains OSHA standards, safety regulations, and practical safety procedures.*
5. Construction Safety and Health – Richard J. Coble *Covers safety management, risk analysis, and accident prevention techniques in construction.*

Web References

1. https://www.osha.gov
2. https://www.ilo.org/safework
3. https://www.tandfonline.com/toc/tose20/current

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	1	2	-	3	-	1	-	-	-	-	1	2	-	2
2	1	2	-	3	-	1	-	-	-	-	1	2	-	2
3	1	2	-	3	-	1	-	-	-	-	1	2	-	2
4	1	2	-	3	-	1	-	-	-	-	1	2	-	2
5	1	2	-	3	-	1	-	-	-	-	1	2	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme : **B.Tech.**						
Semester	**VIII**	Course Category Code: **PE**			End Semester Exam Type: TE			
Course Code	**U23CET824**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**INTELLIGENT TRANSPORTATION SYSTEMS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**Transportation Engineering**		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand ITS fundamentals, roles, responsibilities, security, and safety issues.	**K2**
	CO2	Analyze ITS architecture, hardware, sensors, and vehicle detection techniques.	**K2**
	CO3	Evaluate advanced traffic management (ANPR, video detection, DTA, algorithms).	**K3**
	CO4	Understand smart route systems, travel info dissemination, and business scope.	**K2**
	CO5	Assess global ITS implementations, automated highways, and vehicle platooning.	**K3**

UNIT- I	**INTRODUCTION TO INTELLIGENT TRANSPORT SYSTEM**	**Periods: 8**	
Introduction to Intelligent Transportation Systems (ITS) -Definition – Role and Responsibilities – Advanced Traveller Information System – Fleet Oriented ITS Services – Electronic Toll Collection – Critical issues – Security – Safety			**CO 1**
UNIT- II	**ITS ARCHITECTURE AND HARDWARE**	**Periods: 9**	
Architecture – ITS Architecture Framework – Hardware Sensors – Vehicle Detection – Techniques – Dynamic Message Sign – GPRS – GPS – Toll Collection			**CO 2**
UNIT - III	**ADVANCED TRANSPORT MANAGEMENT SYSTEM**	**Periods: 10**	
.Video Detection – Virtual Loop - Cameras - ANPR – IR Lighting – Integrated Traffic Management – Control Centre – Junction Management Strategies- ATMS – Advanced Traveler Information Systems (ATIS)- Route Guidance – Issues -– Historical – Current – Predictive Guidance – Data Collection – Analysis – Dynamic Traffic Assignment (DTA) – Components – Algorithm.			**CO 3**
UNIT - IV	**ADVANCED TRAVELLER AND INFORMATION SYSTEM**	**Periods: 9**	
Travel Information – Pre Trip and Enroute Methods- Basic ATIS Concepts – Smart Route System – Data Collection – Process – Dissemination to Travelers – Evaluation of Information – Value ofInformation – Business Opportunities			**CO 4**
UNIT - V	**CASE STUDIES**	**Periods: 9**	
Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries			**CO 5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1 Intelligent Transportation Systems – R. Srinivasa Kumar (Orient BlackSwan, 2022)

2 Intelligent Transport Systems: Technologies and Applications – Asier Perallos et al. (Wiley, 2015)

3 Intelligent Transportation Systems: Functional Design – Robert Gordon (Springer, 2016)

Reference Books

1. *Intelligent Transportation Systems: Theory and Practice – Amit Kumar Tyagi (Springer, 2023)*
2. *Intelligent Transportation Systems: From Good Practices to Standards – Paolo Pagano (CRC Press, 2016)*
3. *Advanced Technologies for Intelligent Transportation Systems – Marco Picone et al. (Springer, 2015)*
4. *Intelligent Transportation Systems: Concepts and Cases – Sumedha B. Rajakaruna (Cambridge Scholars, 2022)*
5. *Intelligent Transportation Systems: New Principles and Architectures – A. K. S. S. S. R. Murthy (CRC Press, 2000)*

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	2	2	3	2	2	-	-	-	-	-	1	2	2	3
2	3	3	2	3	3	-	-	-	-	-	1	3	3	2
3	3	3	3	3	3	-	-	-	-	-	1	3	3	3
4	2	3	3	2	3	-	-	-	-	-	1	2	3	3
5	3	3	3	3	3	-	-	-	-	-	1	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VIII**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23CEE825**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Interior Design**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**-Nil-**	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the importance of interior design	**K2**
	CO2 Gain knowledge in different materials used for various surfaces in the kitchen	**K2**
	CO3 Understand the concept and application of colors in interiors	**K2**
	CO4 Understand and learn the concepts of lighting.	**K2**
	CO5 Know about the selection and arrangement of furniture.	**K2**

UNIT-I	**Introduction of Interior Design**	**Periods: 09**	
Design – Meaning and Definition, Types – Structural and Decorative design, their characteristics, classification of decorative design - Elements of Design – Meaning, various elements – line, form and shape, size, color, texture, pattern, space, light.			**CO1**
UNIT-II	**Kitchen Design**	**Periods: 09**	
Kitchen planning – Functions performed in a kitchen, types of kitchen, principles of planning kitchen – orientation and location, ventilation, storage needs, work triangle, colour, light and safety - Principles of Design – Harmony, Balance, Rhythm, Emphasis, proportion - Application of design principles in interiors.			**CO2**
UNIT-III	**Colour in Interior Design**	**Periods: 09**	
Importance of Colour – Colour wheel – Dimension of colour - Hue, value, intensity – Classification of colour - Prang color system, color harmonies – Colour Temperature and Mood – Colour response - Related and contrasting color harmonies, psychology of color. Application of colour in interiors.			**CO3**
UNIT-IV	**Lighting Design**	**Periods: 09**	
Lighting in interiors – importance, classification based on sources, uses, illumination, Factors to be considered in lighting for different areas of house.			**CO4**
UNIT-V	**Furniture Design**	**Periods: 09**	
Furniture - Meaning, need, and purpose. Factors influencing – climate, family needs and preferences, availability, comfort, principles of design and financial limits - Selection and arrangement – Furniture for various rooms –Living room, dining room, bedroom, kitchen, study room, office. Principles of design in furniture arrangement.			**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Seetharaman.P. ,Paannu.P , “Interior Design and Decoration”, CBS Publishers and Distributers Pvt Limited., Chennai India ,2009.
2. Varghese and Ogale, “Home Management”, Wiley Eastern, New Delhi, 1994.
3. Faulkner S, Faulkner R, “Inside Today’s Home”, Rine hart Publishing Company, Newyork, (1987)
4. Caroline cliften et. al., “The Complete Home Decorator”, Portland House New York.

Reference Books

1. Gandotra.V, Shukul.M, and Jaiswal.N, (2011) Introduction to Interior Design and Decoration, Dominant Publishers and Distributors New Delhi.
2. Pratap R.M (1988), “Interior Design Principles and Practice”, Standard Publishers Distribution, Delhi.
3. Goldstein, “Art in Everyday life”, Oxford and IBH Publishing House.

Web References

1. https://ebooks.inflibnet.ac.in/hsp02/chapter/principles-of-design-application-of-design-principles-in-interior/
2. https://www.uou.ac.in/sites/default/files/slm/BHM-602CT.pdf
3. https://interiordesignstudent.com/study-notes/colour-in-interior-design/

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	2	-	-	3	-	-	-	-	-	1	3	3
2	3	3	2	-	-	3	-	-	-	-	-	1	3	3
3	3	3	2	-	-	3	-	-	-	-	-	1	3	3
4	3	3	2	-	-	3	-	-	-	-	-	1	3	3
5	3	3	2	-	-	3	-	-	-	-	-	1	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application-oriented / Problem-solving / Design / Analytical in content beyond the syllabus

Professional Elective - VI

Department	**Civil Engineering**	Programme : **B.Tech.**						
Semester	**VIII**	Course Category Code: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CEE826**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Prestressed Concrete Structures**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite								

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Design a prestressed concrete beam accounting for losses.	**K3**
	CO2 Design for flexure and shear.	**K3**
	CO3 Design the anchorage zone for post tensioned members and deflection in beams.	**K3**
	CO4 Design composite members and continuous beams.	**K3**
	CO5 Design water tanks, pipes and poles.	**K3**

UNIT- I	**INTRODUCTION**	**Periods: 09**
Historical developments – 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.		**CO1**
UNIT- II	**DESIGN FOR FLEXURE AND SHEAR**	**Periods: 09**
Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.		**CO2**
UNIT - III	**DEFLECTION AND DESIGN OF ANCHORAGE ZONE**	**Periods: 09**
Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. 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.		**CO3**
UNIT - IV	**COMPOSITE BEAMS AND CONTINUOUS BEAMS**	**Periods: 09**
Analysis and design of composite beams - Shrinkage strain and its importance – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.		**CO4**
UNIT - V	**MISCELANEOUS STRUCTURES**	**Periods: 09**
Design of tension and compression members – Design of sleepers, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, fifth edition, 2012.
2. Pandit.G.S. And Gupta.S.P. Prestressed Concrete, CBS Publishers and Distributers Pvt. Ltd., Second edition, 2014.

Reference Books

1. Lin T.Y. and Ned.H.Burns, Design of prestressed Concrete Structures, John Wiley and Sons, Third Edition, 1981.
2. Rajagopalan.N, Prestressed Concrete, Narosa Publishing House, 2002.
3. Dayaratnam.P., Sarah P, Prestressed Concrete Structures, Seventh Edition, Oxford and IBH, 2017.

4. Sinha.N.C. And Roy.S.K. Fundamentals of Prestressed Concrete, S.Chand and Co. Ltd., 2011.

Web References
4. https://nptel.ac.in/content/storage2/courses/105105109/pdf/m3l15.pdf
5. https://www.youtube.com/watch?v=uMuFpT1gFVI
6. https://youtu.be/6CLEWA2WNqM
7. https://nptel.ac.in/content/storage2/courses/105101085/downloads/lec-24.pdf
8. https://nptel.ac.in/content/storage2/courses/105105109/pdf/m2l12.pdf

COs/POs/PSOs Mapping

COs	**Program Outcomes (POs)**											**Program Specific Outcomes (PSOs)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
1	3	2	3	-	-	2	-	1	1	-	1	-	-	-
2	3	2	3	-	-	1	-	1	1	-	1	1	1	1
3	3	2	3	-	-	1	-	1	1	-	1	1	-	2
4	2	2	3	-	-	1	-	1	1	-	1	-	1	-
5	2	2	3	-	-	1	-	1	1	-	1	-	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**					**End Semester Examination (ESE) Marks**	**Total Marks**
	CAT 1	**CAT 2**	**Model Exam**	**Assignment***	**Attendance**		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme : **B.Tech.**						
Semester	**VIII**	Course Category Code: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CET827**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Environmental Impact Assessment**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite	**Environmental Engineering**		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the concept of Environmental protection laws	**K2**
	CO2	Understand about EIA methodologies	**K2**
	CO3	Analyze the various mitigation measures	**K3**
	CO4	Understand the concept of socio economic impact assessment	**K2**
	CO5	Assess the concept about economic profile of the community	**K3**

UNIT- I	**LAWS AND ACTS**	**Periods: 9**	
Historical perspective of environmental protection laws and acts in India - Definition of EI, EIA, EIS - Industrial policy statement of the Government of India. Legal and Regulatory aspects in India - Types and Limitations of EIA - Minimum National Standards – Bureau of Indian Standards – WHO standards			**CO1**
UNIT- II	**METHODOLOGIES**	**Periods: 9**	
EIA methodologies – Appropriate Methodologies, Quantification, - Cost benefit analysis - Risk assessment, Test Model format - Preliminary assessment			**CO2**
UNIT - III	**AIR QUALITY IMPACT**	**Periods: 9**	
Background - Typical considerations and factors, air quality impact of industry, transport systems, mitigation methods. Water quality impact: Water quality criteria and standards, Field Surveys waterquality- impacts by developmental projects –Land and soil quality impacts- Soil fertility and remediation. Noise impact: Noise and sound, the effects of noise on people, noise scales and rating methods, estimating transportation noise impact.			**CO3**
UNIT - IV	**ENERGY IMPACT**	**Periods: 9**	
Energy impact considerations, data sources, energy conservation data, EIA of hydro, thermal and nuclear power plants, Vegetation and Wild life impact: Biological concepts and terms, impact on flora and fauna, mitigating measures, alternatives - Types, steps in performing socio economic impact assessment, analysis of public services and facilities, impacts, social impacts			**CO4**
UNIT - V	**SUMMARIZATION OF ENVIRONMENTAL IMPACTS**	**Periods: 9**	
Environmental Management plan, Public involvement - impacts of economic profile of the community, Exchange of information - comparison of alternatives-Training			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1 Trivedi.P.R, Trivedi, P.R, Environmental Impact Assessment, APH Publishing, 2011.

2 S.R. Khandeshwar N.S. Raman, A.R. Gajbhiye "Environmental Impact Assessment" 2010

3 Larry Canter "Environmental Impact Assessment" McGraw Hill publications.1995

Reference Books

1. Canter, L.W (1996) Environmental Impact Assessment, Mc Graw Hill.
2. Petts, J (1999) Handbook of Environmental Impact Assessment Vol.I and II, Blackwell Science, London.
3. Kuala Lampur(1983) "Environmental assessment of development projects", United Nations Asia and Pacific

Development Centre.
4. John, G. Rau and David C. Wooten (1980), Environmental Impact Analysis Hand Book, McGraw Hill Book Co.
5. Judith Petts “Handbook of Environment Impact Assessment” McGraw Hill publications.

Web References

1. http://environmentclearance.nic.in
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ge22/
3. http://www.gpcet.ac.in/wp-content/uploads/2017/03/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	2	2	3	2	2	-	-	-	-	-	1	2	2	3
2	3	3	2	3	3	-	-	-	-	-	1	3	3	2
3	3	3	3	3	3	-	-	-	-	-	1	3	3	3
4	2	3	3	2	3	-	-	-	-	-	1	2	3	3
5	3	3	3	3	3	-	-	-	-	-	1	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**			Programme: **B.Tech.**				
Semester	**VIII**			Course Category Code: **PE** *End Semester Exam Type: **TE**				
Course Code	**U23CEE828**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM / ESE / TM
Course Name	**Natural Disaster and Mitigation**			**3**	**0**	**0**	**3**	**25 / 75 / 100**
Prerequisite								

Course Outcome		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Impart knowledge of causes of various disaster and its impact.	**K2**
	CO2	Identify the consequences and understand control of disasters	**K2**
	CO3	Understand disaster management cycle and its framework	**K2**
	CO4	Recognize various disaster management followed in India.	**K2**
	CO5	Learn about applications of science and technology for disaster management & mitigation	**K2**

UNIT-I	**Fundamentals of Disaster Management**	**Periods: 09**	
Definitions and types of disasters (natural and man-made). Concepts of hazard, vulnerability, risk, and capacity - Relationship between disaster and development - Overview of disaster management principles.			**CO1**
UNIT-II	**Types and Trends of Disasters**	**Periods: 09**	
Geological, hydro-meteorological, biological, technological, and man-made disasters - Global disaster trends and emerging risks - Impact of climate change on urban disasters.			**CO2**
UNIT-III	**Disaster Management Cycle and Strategies**	**Periods: 09**	
Overview of the disaster management cycle - Pre-disaster risk assessment and analysis - Risk mapping, prevention, and mitigation strategies - Early warning systems and preparedness measures - Response mechanisms including search and rescue operations, emergency operation centers, and incident command systems - Recovery frameworks such as IDNDR, Yokohama Strategy, and Hyogo Framework.			**CO3**
UNIT-IV	**Disaster Management Framework in India**	**Periods: 09**	
Disaster profile of India including mega disasters and lessons learned - Disaster Management Act of 2005 - Institutional and financial mechanisms for disaster management in India - Role of government, NGOs, and inter-governmental agencies in disaster response.			**CO4**
UNIT-V	**Technology and Mitigation in Disaster Management**	**Periods: 09**	
Role of geo-informatics in disaster management - Disaster communication systems - Land use planning and development regulations for disaster resilience - Structural and non-structural mitigation measures.			**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Disaster Management Guidelines (GOI-UND Disaster Risk Program) (2009-2012)
2. Introduction to International Disaster Management by Damon P. Copola (2006), Butterworth Heinemann.
3. Disaster Management and Risk Reduction: Role of Environmental Knowledge by A.K. Gupta, S.S. Niar, S. Chatterjee (2013), Narosa Publishing House.
4. Disaster Management by D.B.N. Murthy (2012), Deep & Deep Publications.
5. Managing Natural Disasters by S. Modh (2010), Macmillan Publishers.

Reference Books

1. Natural Hazards and Disaster Management: Vulnerability and Mitigation by R.B. Singh.
2. Disaster Management: Approaches in India by Paritosh Srivastava.
3. Management and Mitigation of Natural Disasters by Rajan Kumar Sahoo.

Web References

1. https://www.unisdr.org/
2. http://www.fema.gov/about/regions/regionii/toolkit_risk.shtm.
3. http://www.colorado.edu/hazards/dr/currentdr.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PSO 1	PSO 2	PSO 3	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	2	1	1	-	2	2	3	1	-	1	3	2	2	1
2	2	1	1	-	2	2	3	1	-	1	3	2	2	1
3	1	2	2	3	3	3	2	2	2	1	3	3	3	2
4	2	1	1	2	3	2	3	2	1	3	3	2	3	2
5	2	2	2	-	1	3	3	1	-	-	-	3	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application-oriented / Problem-solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**			Programme :**B.Tech.**				
Semester	**VIII**			Course Category Code: **PC**		End Semester Exam Type: **TE**		
Course Code	**U23CEE829**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Bridge Engineering**			**3**	**0**	**0**	**3**	**25**	**75**	**100**

Prerequisite			
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the fundamentals, codes of practice and bridge failures.	**K2**
	CO2	Understand the estimation of forces for the design bridge structural elements	**K2**
	CO3	Design of the slab and girder beam bridges using appropriate method	**K4**
	CO4	Understand the design principles of long span bridges	**K2**
	CO5	Understand the design of substructure components e to model the structure to understand the behaviour	**K2**

UNIT- I	**Introduction**	**Periods: 09**	
Classification, investigations and planning, choice of type, I.R.C. specifications for road bridges, standard live loads, other forces acting on bridges, general design considerations, bridge failures.			**CO1**
UNIT- II	**Loads on Bridges**	**Periods: 09**	
Indian Road Congress (IRC) bridge codes – dimensions – dead and live loads – impact effect – wind and seismic forces – longitudinal and centrifugal forces – hydraulic forces – earth pressure – temperature effect and secondary stresses.			**CO2**
UNIT - III	**Slab and T – Beam Bridges**	**Periods: 09**	
Design of slab bridges – skew slab culverts – box culverts. T –Pigeaud curves –Courbon's theory – Hendry Jaegar method design of T – beam bridges.			**CO3**
UNIT - IV	**Long Span Bridges**	**Periods: 09**	
Design Principles of box girder bridges, balanced cantilever bridges, continuous girder bridges, Cable Stayed bridges and Suspension bridges- Design of Prestressed concrete bridges by Courbon's theory (Girder section only) – Design of Steel Concrete composite bridges by Courbons's theory (Girder section only)- Seismic Isolation and damping devices			**CO4**
UNIT - V	**Bearings and Substructure**	**Periods:09**	
Different types of bearings – Design of bearings – Design of masonry and concrete piers and abutments – Types of bridge foundations – Design of Open and deep foundations (well foundation only).			**CO5**
Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. **Essentials of Bridge Engineering** – D.J. Victor *Fundamental concepts, design principles, and construction techniques of bridges.*
2. **Bridge Engineering** – Ponnuswamy *Explains different types of bridges, load considerations, and construction techniques.*
3. **Concrete Bridge Practice: Analysis, Design and Economics** – V.K. Raina *Focuses on the design of reinforced and prestressed concrete bridges.*

Reference Books

1. Bridge Engineering Handbook – Wai-Fah Chen & Lian Duan.
2. Steel Bridges: Conceptual and Structural Design – Manfred Hirt & Jean-Paul Lebet.

3. Structural Analysis and Design of Tall Buildings and Bridges – Bungale S. Taranath.
4. Innovations in Bridge Engineering Technology– Khaled Mahmoud.

Web References

1. https://www.fhwa.dot.gov/bridge/nbi.cfm
2. https://www.fhwa.dot.gov/bridge/
3. https://www.fhwa.dot.gov/bridge/nbi.cfm

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	1	2	-	3	-	1	-	-	-	-	1	2	-	2
2	1	2	-	3	-	1	-	-	-	-	1	2	-	2
3	1	2	-	3	-	1	-	-	-	-	1	2	-	2
4	1	2	-	3	-	1	-	-	-	-	1	2	-	2
5	1	2	-	3	-	1	-	-	-	-	1	2	-	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VIII**	Course Category Code: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23CEE830**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Smart Cities**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite								

Course Outcome		**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1	Describe the concept of smart city and associated challenges.	**K2**
	CO2	Identify the planning and development of smart cities.	**K2**
	CO3	Analyze the process of project management in smart cities.	**K2**
	CO4	Understand the importance of infrastructure planning and development for smart cities.	**K2**
	CO5	Learn about transportation system for smart cities	**K2**

UNIT-I	**Introduction**	**Periods: 09**	
Introduction to smart cities- Definition, dimensions, scope Smart Cities –Global Standards and Performance Benchmarks, Practice Code, Principal stakeholders, key trends in smart cities developments			**CO1**
UNIT-II	**Smart Cities Planning and Development**	**Periods: 09**	
Planning for Urban Infrastructure, Introduction to city planning, key trends in smart cities developments, Sustainable features for smart cities. Role of Planner in the provision of urban networks for different services, Case Study.			**CO2**
UNIT-III	**Project management in Smart Cities**	**Periods: 09**	
Phases, Stages of project and work break down Structure. Project organization structure, Planning, Scheduling and CPM. Project cost analysis, resource allocation & leveling, Line of balancing technique. Project monitoring and control, Project risk management.			**CO3**
UNIT-IV	**Infrastructure Planning and Development for smart Cities**	**Periods: 09**	
Feasibility studies for infrastructure projects, planning for major infrastructure projects, Various Infrastructure Program and policies by MOUD, PPP (DBOOT, BOOT, etc.) in infrastructure projects. Dimension of smart cities, Financing smart cities development, Governance of smart cities, Smart Cities Regulations & Smart Techniques, Case Study.			**CO4**
UNIT-V	**Transportation system for Smart Cities**	**Periods: 09**	
Urbanization and urban mobility, urban land use and transport. Concepts of sustainable mobility, public transportation, pedestrians and bicyclists and parking, fundamentals of the intelligent transportation systems (ITS), Case Study.			**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Jo Beall (1997); “A city for all: valuing differences and working with diversity”; Zed books limited, London (ISBN: 1-85649-477-2).
2. UN-Habitat; “Inclusive and sustainable urban planning: a guide for municipalities”; Volume 3: Urban Development Planning (2007); United Nations Human Settlements Programme (ISBN: 978- 92-1-132024-4).
3. Arup Mitra; “Insights into inclusive growth, employment and wellbeing in India”; Springer (2013), New Delhi (ISBN: 978-81-322-0655-2
4. Mission statement &guidelines on Smart City Scheme". Government of India - Ministry of Urban Development http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines(1).pdf.

Reference Books

1. John S. Pipkin, Mark E. La Gory, Judith R. Balu (Editors); “Remaking the city: Social science perspective on urban design”; State University of New York Press, Albany (ISBN: 0-87395-678-8)
2. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science

3. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE_- 3.12.2014__REVISED_AND_LATEST_.pdf)

Web References

1. IEEE Xplore (www.ieeexplore.ieee.org) – Research papers on smart infrastructure.
2. Springer & Elsevier Journals (www.springer.com, www.elsevier.com) – Civil engineering advancements in Smart Cities.
3. Smart Cities Mission (India) (https://smartcities.gov.in) – Updates on urban smart city projects.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	3	2	-	-	3	-	-	-	-	-	1	3	3
2	3	3	2	-	-	3	-	-	-	-	-	1	3	3
3	3	3	2	-	-	3	-	-	-	-	-	1	3	3
4	3	3	2	-	-	3	-	-	-	-	-	1	3	3
5	3	3	2	-	-	3	-	-	-	-	-	1	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

***** Application-oriented / Problem-solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **OE**				*End Semester Exam Type: **TE**		
Course Code	**U23CEOC01**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**ENERGY AND ENVIRONMENT**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to ECE, ECE, MECH, BME, IT, Mechatronics)

Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Apply the knowledge of science & engineering to the contemporary issues of Energy for better humankind & environment	**K3**
	CO2	Identify, review & analyze the complex problems of Energy crises in environment	**K4**
	CO3	Designing solutions for the energy crises in the form of renewable energy systems to meet the needs by understanding the limitations	**K4**
	CO4	Understanding the impact of energy on environment and providing solutions for sustainable development.	**K5**
	CO5	Apply biomass energy under relevant technologies	**K3**

UNIT-I	**ENERGY**	**Periods: 09**
Introduction, Importance of energy, role of energy consumption in economic and social transformation, Energy needs and crisis. Energy production and utilization. Types and classification of energy sources, Conventional & unconventional energy, Renewable sources & Nonrenewable sources of energy advantages, limitations, comparisons		**CO1**
UNIT-II	**ENVIRONMENT**	**Periods: 09**
Impact of energy on economy &environment. Regional impacts of temperature change - Global warming, Greenhouse effect, Acid rain, Ozone layer depletion. Indian environment degradation, Environmental laws - Water Act-1974 (Prevention & control of pollution), The environment protection act 1986, Air act.		**CO2**
UNIT-III	**HYDROPOWER & GEOTHERMAL ENERGY**	**Periods: 09**
Hydropower Energy – Introduction, Site selection, layout of hydro power plant, components & working, classifications, power station, structure and control. Geothermal Energy - Introduction, Site selection, layout of power plant, components & working, Advantages and disadvantages.		**CO3**
UNIT-IV	**SOLAR & WIND ENERGY**	**Periods: 09**
Sun as source of energy - Introduction, Site selection, layout of power plant components & working, classifications, Types of collectors, collection systems efficiency, Solar cells. Wind Energy - Introduction, advantages/limitations, Site selection, layout of power plant, components &working, classification.		**CO4**
UNIT-V	**ENERGY AUDIT AND MANAGEMENT**	**Periods: 09**
Introduction, advantages/limitations, Photosynthesis, biomass fuel, biomass gasification, biogas from waste biomass, factors affecting biogas generation, types of biogas plant, Biomass programme in India,		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Trivedi R.R. and Jalka K.R, “Energy Management”, Commonwealth Publication, 20177.
2. Diamant R.M.E., “Total Energy”, Pergamon, OxfordPublishers, 2017.
3. N.G. AJJANNA “ Energy auditing & demand side management” first edition, Gouthami Publications, Shimoga
4. Chakrabarti, M.L.Soni, P.V. Gupta,U.S. Bhatnagar “ Power system Engineering” 2001, DhanpatRai&Co, New Delhi.
5. D.P.Kothari, K.C Singal, Rajesh Ranjan, “Renewable Energy sources and Emerging Technologies” second edition , PHI , India

Reference Books

1. Boyle G, Everett B and Ramett J, “Energy systems and sustainability”, Oxford University Press, 2018
2. "Pollution Control Acts, Rules and Notifications", CPCB, Pollution Control series, PC/2/2014, Vol.I,2014
3. Peavy.H, Rowe.D, and Tchobanoglous, G., Environmental Engineering, Tata McGraw-Hill, 2013
4. S.Rao, Dr. BB Parulekar “Energy Technologies” Khanna Publications , New Delhi
5. David M Buchla, Thomas E Kissel, Thomas L Floyd “Renewable Energy systems” Pearson, India
6. Godfrey Boyle “Renewable Energy power for sustainable future” oxford Publications , New Delhi

Web References

1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements
2. https://swayam.gov.in/nd1_noc20_ce23/preview
3. www.iucn.org
4. www.cites.org
5. www.thesummitbali.com/
6. http://engineering geology.gov.in/

COs/POs/PSOs Mapping .

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	2	2	1	-	-	-	-	3	3	3	3
CO2	1	1	1	-	-	2	1	-	-	-	-	3	1	1	1
CO3	2	2	2	2	2	3	3	-	1	1	2	3	3	3	3
CO4	2	2	2	2	3	3	3	-	1	1	2	3	3	3	3
CO5	2	2	2	2	3	3	3	-	1	1	2	3	3	3	3

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **OE**			*End Semester Exam Type: **TE**			
Course Code	**U23CEOC02**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**ENERGY EFFICIENT BUILDINGS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
	(Common to ECE, ECE, MECH)							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the concept and effects of global warming	**K2**
	CO2 Understand Climate system, earth's atmosphere and its components**.**	**K2**
	CO3 Analyze the Impacts of Climate Change on various sectors	**K4**
	CO4 Assess the concept about carbon credit and clean development mechanism	**K3**
	CO5 Understand climate changes, its impact and mitigation activities.	**K2**

UNIT-I	**INTRODUCTION**	**Periods: 09**
Energy consumption of building, Energy efficiency potential in buildings, Energy efficient building design (procedure), Energy efficient building technologies, energy efficient materials, certification of energy efficient building, cooling comfort in hot climates		**CO1**
UNIT-II	**ENERGY EFFICIENCY IMPLEMENTION**	**Periods: 09**
Energy efficiency policies, Target setting and stakeholder engagement, Various building codes and standards, Energy efficient building operation, Passive solar, Natural ventilation, Day lighting of building		**CO2**
UNIT-III	**ENERGY EFFICIENCY MEASUREMENT**	**Periods: 09**
Data and energy efficiency indicators, Evaluation of energy efficiency, The multiple benefits of energy efficiency. Electrical Energy Measurements, Thermal Energy Measurements, Mechanical & Utility System Measurements, Measurement & Verification. Case studies.		**CO3**
UNIT-IV	**ENERGY EFFICIENCY INVESTMENT**	**Periods: 09**
Energy efficiency investment – through policy, through project standardization, through procurement, through funding, finance and fiscal instruments, through energy markets. Case studies with cutting edge of sustainable construction.		**CO4**
UNIT-V	**ENERGY AUDIT AND MANAGEMENT**	**Periods: 09**
Definition, energy audit, need, types of energy audit. energy management (audit) approach - understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments and metering, precautions, smart metering.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Ana-Maria Dabija, “Energy Efficient Building Design”, Springer Nature, 2020
2. Dean Hawkes and Wayne Forster, “Energy Efficient Buildings”, W.W. Norton & Company, 2002
3. Amritanshu Shukla, Atul Sharma, “Sustainability Through Energy-Efficient Buildings”, CRC Press, 2018.
4. Ursula Eicker, “Energy Efficient Buildings with Solar and Geothermal Resources”, John Wiley & Sons, 2014.
5. Jacob J. Lamb and Bruno Georges Pollet, “Energy-Smart Buildings: Design, Construction and Monitoring of Buildings for Improved Energy Efficiency”, Institute of Physics Publishing, 2020

Reference Books

1. Umberto Desideri, Francesco Asdrubali, "Handbook of Energy Efficiency in Buildings: A Life Cycle Approach", Butterworth-Heinemann, 2019.
2. Susan Roaf and Mary Hancock, “Energy Efficient Building: A Design Guide”, Wiley, 1992
3. Xiaoqiang Zhai and Ruzhu Wang, "Handbook of Energy Systems in Green Buildings", Springer Berlin Heidelberg, 2018
4. Roberto Gonzalo, “Energy-efficient architecture”, Walter de Gruyter, 2012
5. José Manuel Andújar and Sergio Gómez Melgar, “Energy Efficiency in Buildings: Both New and Rehabilitated”, MDPI, 2020

Web References

1. https://nptel.ac.in/courses/105/102/105102175/
2. https://nptel.ac.in/courses/105/102/105102195/
3. https://alison.com/course/sustainable-architecture-energy-efficiency-and-quality

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	3	3	3	3	3	3	3	3	3	3
CO2	2	1	1	1	1	3	3	3	3	3	3	3	3	3	3
CO3	2	1	1	1	1	3	3	3	3	3	3	3	3	3	3
CO4	2	1	1	1	1	3	3	3	3	3	3	3	3	3	3
CO5	2	1	1	1	1	3	3	3	3	3	3	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**		Programme: **B.Tech.**					
Semester	**VII**		Course Category Code: **OE**			*End Semester Exam Type: **TE**		
Course Code	**U23CEOC03**		Periods / Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**DISASTER MANAGEMENT**		**3**	**0**	**0**	**3**	**25**	**75**	**100**
(Common to EEE, ECE, CSE, IT, ICE, MECH, BME,CCE,AI&DS)									
Course Outcome	**On completion of the course, the students will be able to**							BT Mapping (Highest Level)	
	CO1	Infer Disasters, man-made Hazards and Vulnerabilities						**K2**	
	CO2	Summarize the flood management studies						**K2**	
	CO3	Identify disaster mitigation and management mechanism						**K1**	
	CO4	Estimate the disaster safety precaution						**K2**	
	CO5	Determine the disaster plan and act						**K3**	

UNIT-I	**DEFINITION AND TYPES**	**Periods: 09**	
Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires			**CO1**
UNIT-II	**STUDY OF IMPORTANT DISASTERS**	**Periods: 09**	
Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements case studies of disasters in Sikkim (e.g.) Earthquakes, Landside). Social Economics and Environmental impact of disasters.			**CO2**
UNIT-III	**MITIGATION AND MANAGEMENT**	**Periods: 09**	
Concepts of risk management and crisis management - Disaster management cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness- Planning for relief.			**CO3**
UNIT-IV	**SAFETY PROCESS**	**Periods: 09**	
Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management			**CO4**
UNIT-V	**PLANNING AND ACT**	**Periods: 09**	
Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Dr. Mrinalini Pandey, Disaster Management, Wiley India Pvt. Ltd
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill Education (India) Pvt. Ltd.
3. Jagbir Singh, Disaster Management : Future Challenges and Opportunities, K W Publishers Pvt. Ltd.
4. J. P. Singhal, Disaster Management, Laxmi Publications
5. C. K. Rajan, Navale Pandharinath, Earth and Atmospheric Disaster Management : Nature and Manmade, B S Publication

Reference Books

1. Disaster Management by Mrinalini Pandey Wiley 2014.
2. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015
3. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
4. National Disaster Management Plan, Ministry of Home affairs, Government of India
5. Manual on Disaster Management, National Disaster Management, Agency Govt of India.

Web References

1. http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf
2. http://nidm.gov.in/pdf/guidelines/new/sdmp.pdf
3. http://sdmassam.nic.in/pdf/publication/undp/disaster_management_in_india.pdf

COs/POs/PSOs Mapping

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
CO2	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
CO3	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
CO4	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3
CO5	3	2	3	2	3	3	2	-	2	2	2	3	1	3	3

Correlation Level: 1-Low, 2-Medium, 3- High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Civil Engineering**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **OE**			*End Semester Exam Type: **TE**			
Course Code	**U23CEOC04**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**AIR POLLUTION AND SOLID WASTE MANAGEMENT**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS)

Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the type, sources & effect of air pollutants	**K2**
	CO2	Know the parameters affecting air pollution and various methods of measurement and estimation of pollutants	**K3**
	CO3	Gain knowledge of basics of noise pollution	**K2**
	CO4	Understand various air pollution control equipment's & pollution caused due to automobile exhaust	**K4**
	CO5	Understand the concepts of solid waste management	**K2**

UNIT-I	**DEFINITION AND TYPES**	**Periods: 09**
Introduction to air pollution: Air pollution episodes, Atmosphere and its zones, classification and sources of air pollutants, effects of air pollutants on man, plants animal & materials		**CO1**

UNIT-II	**STUDY OF IMPORTANT DISASTERS**	**Periods: 09**
Meteorological Aspects: Atmospheric stability, plume behavior, Ambient air sampling and stack sampling, collection of particulates and gaseous pollutants, methods of estimation.		**CO2**

UNIT-III	**MITIGATION AND MANAGEMENT**	**Periods: 09**
Air pollution control methods and equipment: Principle of control methods for particulates and gaseous pollutants, gravity settlers, electrostatic precipitators, bag filters cyclones, wet scrubbers, automobile exhaust: Pollution due to diesel and petrol engines, exhaust treatment and abatement, noise Pollution: Sources, ill effects, control measures.		**CO3**

UNIT-IV	**SAFETY PROCESS**	**Periods: 09**
Introduction to solid waste management, sources, quantification and characterisation, classification and components, sampling and analysis, Method of collection.		**CO4**

UNIT-V	**PLANNING AND ACT**	**Periods: 09**
Equipment used for collection and transportation, transfer stations, solid waste processing and management. Treatment and disposal methods: composting, sanitary landfills, Incineration – concept, components and applications, leachate management.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. M.N. Rao & H.V.N. Rao, 1988, Air Pollution, Tata McGraw Hill Publishing Co. Ltd.
2. C.S. RAO, 2007, Environmental Pollution Control Engineering, New Age International, Wiley Estern Ltd. New Delhi.
3. Stern A. C., 1973, Air pollution, Academic Press.
4. A.D. Bhide & Sunderesan B.B., 1983, Solid Waste Management in Developing countries, INSDOC, New Delhi.
5. Tohobanoglous, 1993, Intgrated Solid Waste Management Engineering Principle and Management Issues, McGraw-Hill publication Ltd.

Reference Books

1. P. Aarne Vesilind, William Worrell & Debra Reinhart, 2002, Solid Waste Engineering, Cengage Learning India pvt. Ltd.
2. Dr. Y Anjaneyulu, 2002, Air Pollution and Control Technologies, Allied Publisher pvt. Ltd.
3. Waste Management: A Reference Handbook. Contributors: Jacqueline Vaughn - Author. Publisher: ABC-Clio
4. K. V. S. G. Murlikrishna, 1995, Air Pollution, Kaushal& Company.

Web References

1. https://nptel.ac.in/courses/120108005/
2. http://cpheeo.gov.in/upload/uploadfiles/files/Part1
3. https://nptel.ac.in/content/storage2/courses/104103022

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	3	2	3	3	3	3	3	2	3	3	2	3
CO2	3	3	2	3	3	3	3	2	3	2	2	3	3	3	3
CO3	3	3	3	2	2	2	3	3	3	3	2	3	3	3	2
CO4	2	3	2	3	2	3	2	3	3	2	2	3	3	3	3
CO5	3	3	3	2	3	3	3	3	3	2	3	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

ANNEXURE IV

Honours / Minors Degree Programme

Green Technologies and Sustainable Engineering

Green Technologies and Sustainable Engineering												
Sl. No	**Sem**	**Course Code**	**Course Title**	**Category**	**Course Type***	**Periods**			**Credits**	**Max. Marks**		
						L	**T**	**P**		**CAM**	**ESM**	**Total**
1	**IV**	**U23GXT401**	Energy, Environment and Renewable Energy Technologies	PC/IC	T	3	0	0	3	25	75	100
2	**V**	**U23GXT502**	Sustainable Energy Systems	PC/IC	T	3	0	0	3	25	75	100
3	**VI**	**U23GXB603**	Green Technologies & Renewable Energy Systems	PC/IC	B	3	0	2	4	50	50	100
4	**VII**	**U23GXB704**	Sustainability in the Built Environment	PC/IC	B	3	0	2	4	50	50	100
5	**VIII**	**U23GXT805**	Green Management	PC/IC	T	3	0	0	3	25	75	100
6	**VIII**	**U23CXW806**	Project work	PC/IC	PA	0	0	4	2	50	50	100
Total Credits									19	225	375	600
Equivalent NPTEL Courses**												
1	**IV**	Energy, Environment and Renewable Energy Technologies		Environmental Chemistry					3	12 Weeks Course		
2	**IV**			Environmental Modeling and Simulation					3			
3	**V**	Sustainable Energy Systems		Sustainable Engineering Concepts and Life Cycle Analysis					3			

**The students shall be given to earn 3 credits through one 12-week NPTEL course (Equivalent) Instead of any one theory course listed for Honour/Minor degree programme and shall be completed before the commencement of eight semester. The equivalent course are subject to change based on its availability a per NPTEL Course List.

* T - Theory, B – Theory cum Practical, PA – Project Work

The students shall be given to earn 3 credits through one 12 week NPTEL course (Equivalent) Instead of any one theory course listed for Honour/Minor degree programme and shall be completed before the commencement of eight semester. The equivalent course are subject to change based o its availability a per NPTEL Course List.

Department	Civil Engineering			Programme: Honours/Minors				
Semester	IV			Course Category Code: PC		End Semester Exam Type: TE		
Course Code	U23CEX401	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Energy Environment and Renewable Energy Technologies	3	0	0	3	25	75	100

Prerequisite: Environmental Science

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the nexus between energy, environment and sustainable development	K4
CO2	Appreciate energy ecosystems and its impact on environment	K4
CO3	Learn basics of various types of renewable and clean energy technologies.	K4
CO4	Serve as bridge to advanced courses in renewable energy	K4
CO5	Understand about energy and economics.	K4

UNIT- I	ENERGY	Periods: 09
Introduction to the nexus between energy, environment and sustainable development, Energy sources over view and classification, sun as the source of energy, fossil fuel reserves and resources - overview of global/ India's energy scenario. Energy consumption models – Specific Energy Consumption.		CO1

UNIT- II	ECOLOGY AND ENVIRONMENT	Periods: 09
Concept and theories of ecosystems, - energy flow in major man-made ecosystems- agricultural, industrial and urban ecosystems - sources of pollution from energy technologies and its impact on atmosphere - air, water, soil, and the environment - environmental laws on pollution control, The environmental protection act: Effluent standards and ambient air quality, innovation and sustainability, eco-restoration: phyto-remediation.		CO2

UNIT - III	RENEWABLE SOURCES OF ENERGY	Periods: 09
Solar Energy: Solar radiation: measurements and prediction. Indian's solar energy potential and challenges, solar energy conversion principles and technologies: Photosynthesis, Photovoltaic conversion and Photo thermal energy conversion. Wind Energy: Atmospheric circulations, atmospheric boundary layers, classification, factors influencing wind, wind shear, turbulence, wind energy basics and power Content, wind speed monitoring, Betz limit, wind energy conversion system: classification, characteristics and applications. Ocean Energy: Ocean energy resources-ocean energy conversion principles and technologies: ocean thermal, ocean wave & ocean tide. Bioenergy: resources and types.		CO3

UNIT - IV	OTHER ENERGY SOURCES AND SYSTEMS	Periods: 09
Hydropower, Nuclear fission and fusion-Geothermal energy: Origin, types of geothermal energy sites, site selection, geothermal power plants; hydrogen energy, Magneto-hydro-dynamic (MHD) energy conversion – Radioisotope Thermoelectric Generator (RTG), Bio-solar cells, battery & super capacitor, energy transmission and conversions		CO4

UNIT - V	ENERGY AND ECONOMY	Periods: 09
Energy and Economics: gross domestic product (GDP) and energy – energy market and society – energy efficiency – energy – energy and economics – energy: security – equity – environmental sustainability index and global measure		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Loulou, Richard; Waaub, Jean- Philippe,"Energy and Environment Set: Mathematics of Decision Making", Zaccour, Georges (Eds.), 2005.

2. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A "Energy and the Environment", 2nd Edition, John Wiley, 2006.

Reference Books
1. Energy and the Challenge of Sustainability, World Energy assessment, UNDP, N York, 2000.
2. Solar Energy: principles of Thermal Collection and Storage, S.P. Sukhatme, Tata McGraw-Hill (1984).
3. D. Y. Goswami, F. Kreith and J. F. Kreider, Principles of Solar Engineering, Taylor and Francis, Philadelphia, 2000.
4. Wind Energy Conversion Systems, L.L. Freris, Prentice Hal 1990.
5. Geothermal Energy: From Theoretical Models to Exploration and Development by Ingrid Sober and Kurt Bucher, Springer, 2013.
6. Ocean Energy: Tide and Tidal Power by R. H. Charlier and Charles W. Finkl, Springer 2010

COs/POs/PSOs Mapping

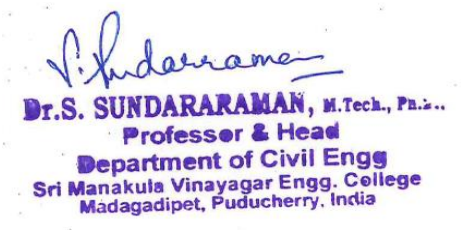
COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
2	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
3	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
4	2	3	-	1	2	3	3	1	-	1	-	2	-	-	3
5	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus



Department	**Civil Engineering**			Programme: **Honours/Minors.**				
Semester	**VI**			Course Category Code: **PC**		End Semester Exam Type: **TE**		
Course Code	**U23CEX502**			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Sustainable Energy Systems**			**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	Environmental Science									
Course Outcomes	**On completion of the course, the students will be able to**								BT Mapping (Highest Level)	
	CO1	Analyze the energy landscape and sustainability to provide solutions to energy problems using appropriate tools and techniques following relevant standards considering society, health and environment besides communicating effectively in graphical form.							**K4**	
	CO2	Analyze solar and wind energy systems to solve the complex energy problems using appropriate tools and techniques following relevant standards considering society, health, environment, sustainability and economics besides communicating effectively in graphical form.							**K4**	
	CO3	Analyze biomass, geothermal, tidal and wave energy systems to solve the complex energy problems using appropriate tools and techniques following relevant standards considering society, health, environment, sustainability and economics besides communicating effectively in graphical form.							**K4**	
	CO4	Analyze electric storage technology systems to solve the complex energy problems using appropriate tools and techniques following relevant standards and latest developments considering society, health, environment, sustainability and economics besides communicating effectively in graphical form							**K4**	
	CO5	Analyze grid integration of renewable energy to solve the complex energy problems using appropriate tools and techniques following relevant standards considering society, health, environment, sustainability and economics besides communicating effectively in graphical form.							**K4**	
UNIT- I	**THE ENERGY LANDSCAPE AND SUSTAINABILITY**								**Periods: 09**	
Current global energy use, National and international energy consumption and related greenhouse gas emissions, Lifetime of fossil fuels, Sustainability and energy use, Energy conversion technologies, Energy forms and conversion, First and second laws of thermodynamics and efficiencies; Devices - Heat engines, Refrigerators, Heat pumps; Instantaneous and average power										**CO1**
UNIT- II	**SOLAR AND WIND ENERGY**								**Periods: 09**	
Principles of solar radiation, Resource foundations, Technology challenges, Sustainability, Solar energy industry and economics, Net Metering; Origin of the wind, Power in the wind, Wind resource basics, Wind energy technologies, Challenges, Sustainability, Wind energy Industry.										**CO2**
UNIT - III	**BIOMASS, GEOTHERMAL, TIDAL AND WAVE ENERGIES**								**Periods: 09**	
Sources of feedstocks; Biofuels - Bioethanol, Biodiesel, Algal, Jatropha and Biogas; Conversion technology, Diesel and ethanol, Biogas, Electricity production, Transportation, Challenges, Sustainability, Economics; Geothermal energy - Principles, Geothermal potential and technology, Electricity production, Conversion technology, Challenges, Economics; Tidal and wave energies, Conversion technologies, Sustainability.										**CO3**
UNIT - IV	**ELECTRICITY STORAGE TECHNOLOGIES**								**Periods: 09**	
Introduction, Battery energy storage technologies - Lithium-ion batteries, Full cells, Nickel-based batteries, Lead-acid batteries, Sodium-sulfur batteries; Hydro energy storage - Applications of pump hydro energy storage plant, Site selection for pump hydro energy storage plant; Thermal energy storage, Capacitors and applications, Latest developments										**CO4**
UNIT - V	**GRID INTEGRATION OF RENEWABLE ENERGY**								**Periods: 09**	
Variability, Intermittency and dispatchability, Electric grid infrastructure, Integrating renewable energy into the grid, Growing a more efficient grid, The smart grid, Secure communication in the smart grid; Cogeneration plant and power distribution in industry, Micro grids.										**CO5**
Lecture Periods: 45		**Tutorial Periods: 15**		**Practical Periods: -**					**Total Periods: 60**	

Text Books

1. Boyle, Godfrey, "*Renewable Energy: Power for a Sustainable Future"*, Oxford University Press, 3rd Edition, 2012.
2. efferson W. Tester, Elisabeth M. Drake, Michael J. Driscoll, Michael W. Golay, William A. Peters, "*Sustainable Energy (Choosing Among Options)"*, MIT Press, 2nd Edition, 2012.

Reference Books

1. Gilbert M. Masters, "*Renewable and Efficient Electric Power Systems"*, John Wiley &Sons, Inc., Hoboken, New Jersey, 2nd Edition, 2013
2. Vanek, F.M., Albright, L.D., "*Energy Systems Engineering - Evaluation and Implementation"*, McGraw-Hill, 2nd Edition, 2008.
3. David MacKay, "*Sustainable Energy: Without the Hot Ai"r*, UIT Cambridge Ltd., Cambridge, England, 2009.
4. Frank Kreith, "*Principles of Sustainable Energy Systems*," , CRC Press, Taylor and Francis group, 2nd Edition, 2014.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
2	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
3	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
4	2	3	-	1	2	3	3	1	-	1	-	2	-	-	3
5	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
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Department	**Civil Engineering**			Programme: **Honours/Minors.**			
Semester	**V**			Course Category Code: **PC**		End Semester Exam Type: **TE**	
Course Code	**U23CEX603**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Green Technologies & Renewable Energy Systems**	**2**	**0**	**2**	**4**	**25**	**75**	**100**
Prerequisite	Environmental Science							

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Analyze cleaner development mechanism (CDM).	**K4**
	CO2	Understand various aspects of green buildings	**K4**
	CO3	Analyze renewable energy systems as a part of green technology	**K4**

UNIT- I	**CLEANER DEVELOPMENT MECHANISM**	**Periods: 10**
Cleaner development mechanisms, role of industry; reuse, reduce and recycle, raw material substitution; wealth from waste; carbon credits, carbon trading, carbon sequestration, eco labeling; Oxidation technology for waste water treatment- Cavitation, Fenton chemistry, photocatalysis and hybrid processes.		**CO1**
UNIT - II	**GREEN BUILDINGS & SUSTAINABLE URBANIZATION**	**Periods: 10**
Basic Features, advantages & limitations, Energy efficient buildings- methods for increasing energy efficiency of buildings, building components, ventilation system, Energy need and supply, use of solar photovoltaic system and sun-tracking system, Sustainable cities, Sustainable transportation.		**CO2**
UNIT - III	**RENEWABLE ENERGY**	**Periods: 10**
Various renewable energy sources, Solar Energy Systems: Solar radiations data; Solar energy collection, Storage and applications, Hydro Energy Systems: Resource assessment of micro and small hydro power: WindEnergy Systems, bio-fuels, fuel cells.		**CO3**

List of Experiments:

1. Calculate the carbon footprint of a small business
2. Calculate the carbon footprint of a household
3. Design a rainwater harvesting system for a small community
4. CAD software for sustainable building design
5. cost-benefit analysis for a solar farm
6. Life cycle assessment (LCA) tools

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 60**

Text Books

1. M. Lancaster, “Green Chemistry – An introductory text”, RSC.
2. Rashmi Sanghi and M.M. Srivastava, “Green Chemistry-Environment Friendly Alternatives”, NarosaPublishing House, New Delhi 2009.

Reference Books

1. Paul L. Bishop, Pollution prevention –Fundamentals and Practices, McGraw-Hill- international 2000
2. Mili Majumdar, “Energy Efficient Buildings in India”’ Tata Energy Research Institute.
3. Volker Quaschning, “Understanding Renewable Energy Systems”.
4. Abbasi & Abbasi, “Renewable Energy Sources and Their Environmental Impacts”, Prentice Hall of India.
5. B.H Khan, “Non conventional energy resources”, Tata McGraw-Hill, New Delhi 2006.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
2	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
3	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
4	2	3	-	1	2	3	3	1	-	1	-	2	-	-	3
5	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Semester	VII	Course Category Code: **PC**			End Semester Exam Type: **TE**		
Course Code	**U23CEX704**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Sustainability in the Built Environment**	**2**	**0**	**2**	**4**	**25**	**75**	**100**

Prerequisite	Environmental science		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Analyze sustainable urban development to solve problems associated with the built environment using appropriate tools and techniques following relevant standards considering society, health and environment besides communicating effectively in graphical form	**K4**
	CO2	Analyze sustainable site planning to solve complex problems associated with the built environment using appropriate tools and techniques following relevant standards considering society, health and environment besides communicating effectively in graphical form.	**K4**
	CO3	Analyze sustainable buildings to solve complex problems associated with the built environment using appropriate tools and techniques following relevant standards considering society, health and environment besides communicating effectively in graphical form.	**K4**

UNIT - I	**SUSTAINABLE BUILDINGS**	**Periods: 10**
Introduction to sustainable buildings and standards, Green buildings, Energy efficiency and sustainability; Passive House; Net Zero Energy Buildings (NZEB), Examples of different types of NZEB.		**CO3**
UNIT - II	**BUILDING ENVELOPE AND SERVICES**	**Periods: 10**
Building envelope effect and energy efficiency measures, Renewable energy integration, Sustainable building services, Sustainable construction and materials, Integrated design, Energy use and CO2, Built environment - Aging and susceptibility to natural disasters.		**CO4**
UNIT - III	**MANAGEMENT OF SUSTAINABLE BUILT ENVIRONMENT**	**Periods: 10**
Life cycle planning, Measuring sustainability; Facilities management – Waste management, Improved amenities, Improved transport infrastructure, social mix, Accessibility issues, Cultural and historical issues.		**CO5**

List of Experiments:

1. Develop a sustainable transportation plan for a small community
2. Conduct an energy audit of a small building or facility.
3. Develop an energy-saving plan and present findings
4. Conduct an energy efficiency audit for a building.
5. Energy audit of a small building or home
6. Energy modeling software - **eQUEST**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 60**

Text Books

1. Alison Cotgrave and Mike Riley, "*Total Sustainability in the Built Environment"*, Macmillan Education, 1st Edition, 2012.
2. Kevin Lynch and Gary Hack, "*Site Planning"*, MIT Press, 3rd Edition, 1984.

Reference Books

1. William McLean and Pete Silver, "*Environmental Design Source Book: Innovative Ideas for a Sustainable Built Environment"*, RIBA Publishing, 1st Edition, 2021.
2. Tim Dixon, John Connaughton, Stuart Green, "*Sustainable Futures in the Built Environment to 2050: A Foresight Approach to Construction and Development"*, John
3. Rob Fleming, Saglinda H Roberts, "*Sustainable Design for the Built Environment"*, Routledge Press, London, 1st Edition, 2019

4. Charles J. Kibert, "*Sustainable Construction: Green Building Design and Delivery",* Wiley,4th Edition, 2021.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
3	2	3	-	1	2	3	3	1	-	1	-	-	-	-	3
4	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3
5	2	3	-	1	2	3	3	1	-	1	2	-	-	-	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

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