Dr. M.G.R.
EDUCATIONAL AND RESEARCH INSTITUTE
DEEMED TO BE UNIVERSITY
University with Graded Autonomy Status
(An ISO 21001 : 2018 Certified Institution)
Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India.

FACULTY OF ENGINEERING AND TECHNOLOGY

OUTCOME BASED EDUCATION

CURRICULUM & SYLLABUS

BACHELOR OF TECHNOLOGY
CIVIL ENGINEERING

DEPARTMENT OF

CIVIL ENGINEERING

VISION OF THE DEPARTMENT OF CIVIL ENGINEERING

To achieve the pinnacle of success in the area of sustainable construction and green technologies, thus stimulating economic growth and making the society a better place to live in

THE MISSION OF THE DEPARTMENT OF CIVIL ENGINEERING

M1: To produce graduates who possess technical competence in the field of Civil Engineering with integrity and commitment
M2: To prepare them to serve and contribute as professional engineers, innovators, leaders and entrepreneurs in the global community

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Program Educational Objectives of the department are:

PEO 1: To apply fundamental knowledge of basic sciences and engineering to find creative solutions to challenges in civil engineering
PEO 2: To analyze, design and apply skills to address civil engineering problems.
PEO 3: To practice civil engineering in a professional and ethical manner and to implement sustainable technologies for the benefit of industry and society.
PEO 4: To enhance knowledge through research and development in civil engineering using current technologies
PEO 5: To produce professionally competent engineers by improving their software skills, communication skills, managerial skills and entrepreneurship quality to prepare them for lifelong learning

PROGRAM SPECIFIC OUTCOMES (PSOs)

The Program Specific Objectives of the department is to produce professional Civil Engineers with the potential:

PSO 1: To analyze, design and apply technical knowledge with up-to-date skills to solve civil engineering complexities
PSO 2: To function as an individual or in a team to find sustainable solutions in civil engineering domain through research and development

PROGRAM OUTCOMES (POs)

The general Program outcomes of Civil Engineering are as follows:

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

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

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

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

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

10. 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.

11. 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.

12. 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.

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Faculty of Engineering and Technology

Regulation 2022 – Framework

Total Credits: 166

Credit for I & II Semester: 37 Credits

Credit for III TO VIII Semester: 129 Credits

Program Components

• Basic Science (Mathematics) include according to program - 8		
• Program Core theory	-	15
• Program Core Laboratory	-	10
• Program Elective	-	5
• Open Elective	-	2
• Open Lab	-	1
• Management paper	-	1
• Foreign Language	-	1
• Audit course	-	2
• Universal Human values	-	1
• Inter disciplinary theory	-	3
• Inter disciplinary Lab	-	3
• ETL	-	2
• Technical Skills	-	3
• Soft skill	-	2
• Project /mini project	-	3

Curriculum with Course codes for B.Tech (Civil Engineering)

SEMESTER – I

Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
EBEN22001	Technical English	Ty	2	0/0	0/0	2	HS
EBMA22001	Mathematics – I	Ty	3	1/0	0/0	4	BS
EBPH22ET1	Engineering Physics	ETL	2	0/0	2/0	3	BS
EBCH22ET1	Engineering Chemistry	ETL	2	0/0	2/0	3	BS
EBEE22ET1	Basic Electrical & Electronics Engineering	ETL	2	0/0	2/0	3	ES
EBCS22ET1	C Programming and MS office tools	ETL	1	0/0	2/0	2	ID
EBCC22I01	Orientation to Entrepreneurship & Project lab	IE	0	0/0	2/0	1	ID

Credits Sub Total: 18

SEMESTER – II

Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
EBMA22003	Mathematics – II	Ty	3	1/0	0/0	4	BS
EBPH22002	Engineering Mechanics	Ty	3	0/0	0/0	3	BS
EBCH22002	Industrial Chemistry	Ty	3	0/0	0/0	3	BS
EBME22001	Engineering Graphics	Ty	2	0/0	2/0	3	ES
EBCE22001	Smart Structures and Smart Materials	Ty	3	0/0	0/0	3	PC
EBCC22I02	Communicative English Lab	IE	1	0/0	1/0	1	HS
EBCS22ET2	Python Programming	ETL	1	0/0	2/0	2	ID
EBCC22I03	Environmental Science (Audit Course)	IE	1	0/0	1/0	0	HS

Credits Sub Total: 19

TOTAL CREDITS FOR I YEAR: 37

Note:

Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and lab/Internal evaluation

L/T/SLr/P/R/C: Lecture/Tutorials/Supervised Learning/Practical/Research/Credit

HS: Humanities and Social Science, ES: Engg. Science, BS: Basic Science, PC: Program core, PE: Program Elective, OE: Open Elective, P: Project

III SEMESTER								
S.NO.	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBMA22005	Mathematics III For Mechanical and Civil Engineers	Ty	3	1/0	0/0	4	BS
2	EBCE22002	Mechanics of Solids	Ty	3	1/0	0/0	4	PC
3	EBCE22003	Hill and advanced Surveying	Ty	3	0/0	0/0	3	PC
4	EBEE22ID7	Energy Conservation Techniques	Ty	3	0/0	0/0	2	ID
5	EBME22ID2	Composite Materials	Ty	3	0/0	0/0	2	ID
PRACTICALS								
1	EBCC22ET1	Universal Human Values 2: Understanding Harmony	ETL	1	0/0	2/0	2	ID
2	EBCE22L01	Surveying Laboratory	Lb	0	0/0	3/0	1	PC
3	EBCE22L02	Strength of Materials Laboratory	Lb	0	0/0	3/0	1	PC
4	EBCT22IL1	Water analysis laboratory	Lb	0	0/0	2/0	1	ID
5	EBCE22ET1	Building Materials	ETL	1	0/0	2/0	2	PC
Credits Sub Total							**22**	

IV SEMESTER								
S.NO.	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBMA22008	Statistical and Numerical methods for Mechanical and Civil Engineers	Ty	3	1/0	0/0	4	BS
2	EBCE22004	Strength of Materials	Ty	3	1/0	0/0	4	PC
3	EBCE22005	Fluid Mechanics and Hydraulic Engineering	Ty	3	1/0	0/0	4	PC
4	EBEC22ID5	Applications of IoT in Civil Engineering	Ty	3	0/0	0/0	2	ID
5	EBCC22I04/ EBCC22I05	The Indian Constitution/ The Indian Traditional Knowledge (Audit Course)	IE	2	0/0	0/0	0	ID
PRACTICALS								
1	EBMA22IL1	Mathematical software for Civil Engineers	Lb	0	0/0	2/0	1	ID
2	EBCE22L03	Fluid Mechanics and Hydraulic Machinery Laboratory	Lb	0	0/0	3/0	1	PC
3	EBCE22L04	AUTOCADD laboratory	Lb	0	0/0	3/0	1	PC
4	EBCS22IL4	Artificial Intelligence and Machine Learning laboratory	Lb	0	0/0	2/0	1	ID
5	EBCE22I01	Technical Skill I	IE	0	0/0	2/0	1	SC
6	EBCC22I06	Soft Skill I – Employability skills	IE	0	0/0	2/0	1	SC
Credits Sub Total							**20**	

V SEMESTER								
S.NO.	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBCE22006	Environmental Engineering	Ty	3	1/0	0/0	4	PC
2	EBCE22007	Soil Mechanics	Ty	3	1/0	0/0	4	PC
3	EBCE22008	Concrete Technology	Ty	3	0/0	0/0	3	PC
4	EBCE22EXX	Program Elective I	Ty	3	0/0	0/0	3	PE
5	EBXX22OEX	Open Elective I	Ty	3	0/0	0/0	3	ID
6	EBOL22I01	Online Course (NPTEL/SWAYAM/Any online MOOC course approved by AICTE/UGC)	IE	1	0/0	1/0	1	ID
PRACTICALS								
1	EBCE22L05	Environmental Engineering laboratory	Lb	0	0/0	3/0	1	PC
2	EBCE22L06	Soil Mechanics Laboratory	Lb	0	0/0	3/0	1	PC
3	EBCE22I02	Technical Skill II	IE	0	0/0	2/0	1	SC
4	EBCE22ET2	Remote Sensing and GIS	ETL	1	0/0	2/0	2	PC
Credits Sub Total							**23**	

VI SEMESTER								
S.NO.	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBCE22009	Structural Analysis	Ty	3	1/0	0/0	4	PC
2	EBCE22010	Design of Concrete structures	Ty	3	1/0	0/0	4	PC
3	EBCE22011	Foundation Engineering	Ty	3	1/0	0/0	4	PC
4	EBCE22EXX	Program Elective II	Ty	3	0/0	0/0	3	PE
5	EBXX22OEX	Open Elective II	Ty	3	0/0	0/0	3	OE
PRACTICALS								
1	EBCE22L07	Concrete Laboratory	Lb	0	0/0	3/0	1	PC
2	EBCE22L08	Irrigation and Environmental Engineering Drawing	Lb	0	0/0	3/0	1	PC
3	EBCC22I07	Soft Skill II (Qualitative and Quantitative Skills)	IE	0	0/0	2/0	1	SC
4	EBCE22I03	Technical Skill III	IE	0	0/0	2/0	1	SC
5	EBCE22I04	Mini Project / Internship	IE	0	0/0	3/0	1	SC
Credits Sub Total							**23**	

VII SEMESTER								
S.NO.	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBCE22012	Design of Steel Structures	Ty	3	1/0	0/0	4	PC
2	EBCE22EXX	Program Elective III	Ty	3	0/0	0/0	3	PE
3	EBCE22013	Estimation and Quantity Surveying	Ty	3	1/0	0/0	4	PC
4	EBCE22014	Construction Management	Ty	3	1/0	0/0	4	PC
5	EBCE22015	Transportation Engineering	Ty	3	0/0	0/0	3	PC
PRACTICALS								
1	EBXX22OLX	Open Lab	Lb	0	0/0	3/0	1	ID
2	EBCE22L09	Structural design studio	Lb	0	0/0	3/0	1	PC
3	EBCE22L10	Transportation Engineering laboratory	Lb	0	0/0	3/0	1	PC
4	EBCE22I05	Project Phase – I	IE	0	0/0	3/3	2	P
5	EBFL22IXX	Foreign Language	IE	1	0/0	1/0	1	HS
Credits Sub Total							**24**	

VIII SEMESTER								
S.NO.	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBCC22ID3	Total Quality Management	Ty	3	0/0	0/0	3	ID
2	EBCE22EXX	Program Elective IV	Ty	3	0/0	0/0	3	PE
3	EBCE22EXX	Program Elective V	Ty	3	0/0	0/0	3	PE
PRACTICALS								
1	EBCE22L11	Project Phase – II	Lb	0	0/0	12/12	8	P
						Credits Sub Total		**17**

TOTAL CREDITS: 166

LIST OF PROGRAM ELECTIVES

PROGRAM ELECTIVE I								
S.NO.	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBCE22E01	Engineering Geology	Ty	3	0/0	0/0	3	PE
2	EBCE22E02	Cleaner Production	Ty	3	0/0	0/0	3	PE
3	EBCE22E03	Building Technology and Habitat Engineering	Ty	3	0/0	0/0	3	PE
4	EBCE22E04	Architecture and Town Planning	Ty	3	0/0	0/0	3	PE

PROGRAM ELECTIVE II								
S.NO.	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBCE22E05	Hydrology	Ty	3	0/0	0/0	3	PE
2	EBCE22E06	Environmental Impact Assessment	Ty	3	0/0	0/0	3	PE
3	EBCE22E07	Bridge Structures	Ty	3	0/0	0/0	3	PE
4	EBCE22E08	Irrigation Engineering	Ty	3	0/0	0/0	3	PE

PROGRAM ELECTIVE III								
S.NO.	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBCE22E09	Prestressed Concrete Structures	Ty	3	0/0	0/0	3	PE
2	EBCE22E10	Housing Planning and Design	Ty	3	0/0	0/0	3	PE
3	EBCE22E11	Industrial Waste Management	Ty	3	0/0	0/0	3	PE
4	EBCE22E12	Cost Effective Buildings	Ty	3	0/0	0/0	3	PE

PROGRAM ELECTIVE IV								
S.NO.	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBCE22E13	Structural Dynamics and Earth Quake Engineering	Ty	3	0/0	0/0	3	PE
2	EBCE22E14	Dam Engineering	Ty	3	0/0	0/0	3	PE
3	EBCE22E15	Industrial Structures	Ty	3	0/0	0/0	3	PE
4	EBCE22E16	Advanced Environmental Engineering	Ty	3	0/0	0/0	3	PE

PROGRAM ELECTIVE V								
S.NO.	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBCE22E17	Repair and Rehabilitation of Structures	Ty	3	0/0	0/0	3	PE
2	EBCE22E18	Municipal Solid Waste Management	Ty	3	0/0	0/0	3	PE
3	EBCE22E19	Finite Element Analysis	Ty	3	0/0	0/0	3	PE
4	EBCE22E20	Pre Fabricated Structures	Ty	3	0/0	0/0	3	PE

LIST OF OPEN ELECTIVES OFFERED FOR CIVIL ENGINEERING STUDENTS

DEPARTMENT WISE OPEN ELECTIVES

COMPUTER SCIENCE AND ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBCS22OE1	Cyber security & Forensics	Ty	3	0/0	0/0	3	ID
2	EBCS22OE2	Artificial Intelligence	Ty	3	0/0	0/0	3	ID
3	EBCS22OE3	Data Base Concepts	Ty	3	0/0	0/0	3	ID
4	EBCS22OE4	Software Engineering	Ty	3	0/0	0/0	3	ID

INFORMATION TECHNOLOGY

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBIT22OE1	Web Design	Ty	3	0/0	0/0	3	ID
2	EBIT22OE2	Digital Marketing	Ty	3	0/0	0/0	3	ID
3	EBIT22OE3	Cyber Security Essentials	Ty	3	0/0	0/0	3	ID
4	EBIT22OE4	Introduction to Multimedia	Ty	3	0/0	0/0	3	ID

ELECTRONICS AND COMMUNICATION ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBEC22OE1	Internet of Things and its Applications	Ty	3	0/0	0/0	3	ID
2	EBEC22OE2	Cellular Mobile communication	Ty	3	0/0	0/0	3	ID
3	EBEC22OE3	Satellite and its Applications	Ty	3	0/0	0/0	3	ID
4	EBEC22OE4	Fundamentals of Sensors	Ty	3	0/0	0/0	3	ID
5	EBEC22OE5	Microprocessor Based System Design	Ty	3	0/0	0/0	3	ID
6	EBEC22OE6	Industry 4.0 Concepts	Ty	3	0/0	0/0	3	ID

ELECTRICAL AND ELECTRONICS ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBEE22OE1	Electrical Safety for Engineers	Ty	3	0/0	0/0	3	ID
2	EBEE22OE2	Energy Conservation Techniques	Ty	3	0/0	0/0	3	ID
3	EBEE22OE3	Electric Vehicle Technology	Ty	3	0/0	0/0	3	ID
4	EBEE22OE4	Biomedical Instrumentation	Ty	3	0/0	0/0	3	ID
5	EBEE22OE5	Industrial Instrumentation	Ty	3	0/0	0/0	3	ID
6	EBEE22OE6	Solar Energy Conversion System	Ty	3	0/0	0/0	3	ID
7	EBEE22OE7	Wind Energy Conversion System	Ty	3	0/0	0/0	3	ID
8	EBEE22OE8	Energy Storage Technology	Ty	3	0/0	0/0	3	ID
9	EBEE22OE9	Electrical Machines	Ty	3	0/0	0/0	3	ID

MECHANICAL ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBME22OE1	Industrial Engineering	Ty	3	0/0	0/0	3	ID
2	EBME22OE2	Refrigeration and Air conditioning	Ty	3	0/0	0/0	3	ID
3	EBME22OE3	Automobile Engineering	Ty	3	0/0	0/0	3	ID
4	EBME22OE4	Industrial Robotics	Ty	3	0/0	0/0	3	ID
5	EBME22OE5	Sustainable Energy	Ty	3	0/0	0/0	3	ID
6	EBME22OE6	Composite Materials	Ty	3	0/0	0/0	3	ID
7	EBME22OE7	Industry 4.0	Ty	3	0/0	0/0	3	ID
8	EBME22OE8	Virtual and Augmented Reality	Ty	3	0/0	0/0	3	ID

BIOTECHNOLOGY

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBBT22OE1	Food and Nutrition	Ty	3	0/0	0/0	3	ID
2	EBBT22OE2	Human Physiology	Ty	3	0/0	0/0	3	ID
3	EBBT22OE3	Clinical Biochemistry	Ty	3	0/0	0/0	3	ID
4	EBBT22OE4	Bioprocess Principles	Ty	3	0/0	0/0	3	ID
5	EBBT22OE5	Biosensors and Biomedical Devices in Diagnostics	Ty	3	0/0	0/0	3	ID
6	EBBT22OE6	Basic Bioinformatics	Ty	3	0/0	0/0	3	ID

CHEMICAL ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBCT22OE1	Fundamentals of Nanoscience	Ty	3	0/0	0/0	3	ID
2	EBCT22OE2	Electrochemical Engineering	Ty	3	0/0	0/0	3	ID
3	EBCT22OE3	Alternative Fuels And Energy System	Ty	3	0/0	0/0	3	ID
4	EBCT22OE4	Petrochemical Unit Processes	Ty	3	0/0	0/0	3	ID
5	EBCT22OE5	Principles of Desalination Technologies	Ty	3	0/0	0/0	3	ID
6	EBCT22OE6	Piping Design Engineering	Ty	3	0/0	0/0	3	ID
7	EBCT22OE7	E- Waste Management	Ty	3	0/0	0/0	3	ID

Dr APJ ABDUL KALAM CENTER FOR RESEARCH

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBMG22OE1	Technical Entrepreneurship	ETL	2	0/1	2/0	3	ID
2	EBMG220E2	Advanced Program in Entrepreneurship	ETL	2	0/1	2/0	3	ID

LIST OF OPEN ELECTIVES OFFERED FOR OTHER DEPARTMENT STUDENTS FROM CIVIL ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBCE22OE1	Water Pollution and its Management	Ty	3	0/0	0/0	3	ID
2	EBCE22OE2	Air Pollution and Control	Ty	3	0/0	0/0	3	ID
3	EBCE22OE3	Green Building and Vastu Concepts	Ty	3	0/0	0/0	3	ID
4	EBCE22OE4	Climate Change and Sustainable Development	Ty	3	0/0	0/0	3	ID
5	EBCE22OE5	Intelligent Transportation Systems	Ty	3	0/0	0/0	3	ID
6	EBCE22OE6	Environment, Health and Safety in Industries	Ty	3	0/0	0/0	3	ID
7	EBCE22OE7	Industrial Pollution Prevention and Cleaner Production	Ty	3	0/0	0/0	3	ID
8	EBCE22OE8	Fundamentals of nanoscience	Ty	3	0/0	0/0	3	ID

LIST OF OPEN LABS OFFERED FOR CIVIL ENGINEERING STUDENTS
DEPARTMENT WISE OPEN LABS

COMPUTER SCIENCE AND ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBCS22OL1	Artificial Intelligence Lab	Lb	0	0/0	3/0	1	ID
2	EBCS22OL2	PHP/My SQL Programming Lab	Lb	0	0/0	3/0	1	ID
3	EBCS22OL3	Database Lab	Lb	0	0/0	3/0	1	ID

INFORMATION TECHNOLOGY

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBIT22OL1	Visual Programming Lab	Lb	0	0/0	3/0	1	ID
2	EBIT22OL2	Web Design Lab	Lb	0	0/0	3/0	1	ID
3	EBIT22OL3	Digital content creation Lab	Lb	0	0/0	3/0	1	ID
4	EBIT22OL4	Computer Network Lab	Lb	0	0/0	3/0	1	ID
5	EBIT22OL5	PHP/My SQL Programming Lab	Lb	0	0/0	3/0	1	ID

ELECTRONICS AND COMMUNICATION ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBEC22OL1	Sensors and IoT Lab	Lb	0	0/0	3/0	1	ID
2	EBEC22OL2	Robotics Control Lab	Lb	0	0/0	3/0	1	ID
3	EBEC22OL3	Basics of MATLAB	Lb	0	0/0	3/0	1	ID

ELECTRICAL AND ELECTRONICS ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBEE22OL1	Transducer Lab	Lb	0	0/0	3/0	1	ID
2	EBEE22OL2	PLC and SCADA Lab	Lb	0	0/0	3/0	1	ID
3	EBEE22OL3	Electrical Maintenance Lab	Lb	0	0/0	3/0	1	ID
4	EBEE22OL4	Power Electronics Lab	Lb	0	0/0	3/0	1	ID
5	EBEE22OL5	Bio Medical Instrumentation Lab	Lb	0	0/0	3/0	1	ID
6	EBEE22OL6	Electrical Machines Lab	Lb	0	0/0	3/0	1	ID

MECHANICAL ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBME22OL1	Internal Combustion Engines and Steam Lab	Lb	0	0/0	3/0	1	ID
2	EBME22OL2	Computer Aided Design and Simulation Lab	Lb	0	0/0	3/0	1	ID
3	EBME22OL3	Engineering Metrology Lab	Lb	0	0/0	3/0	1	ID
4	EBME22OL4	Automation Lab	Lb	0	0/0	3/0	1	ID
5	EBME22OL5	Virtual and Augmented Reality Lab	Lb	0	0/0	3/0	1	ID

BIOTECHNOLOGY

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBBT22OL1	Basic Biochemistry Lab	Lb	0	0/0	3/0	1	ID
2	EBBT22OL2	Basic Bioprocess Lab	Lb	0	0/0	3/0	1	ID
3	EBBT22OL3	Basic Microbiology Lab	Lb	0	0/0	3/0	1	ID
4	EBBT22OL4	Basic Bioinformatics Lab	Lb	0	0/0	3/0	1	ID

CHEMICAL ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBCT22OL1	Chemical Separation Lab	Lb	0	0/0	3/0	1	ID
2	EBCT22OL2	Chemical Composition Analysis Lab	Lb	0	0/0	3/0	1	ID
3	EBCT22OL3	Alternate Fuel Lab	Lb	0	0/0	3/0	1	ID
4	EBCT22OL4	Food Testing Laboratory	Lb	0	0/0	3/0	1	ID

LIST OF OPEN LABS OFFERED FOR OTHER DEPARTMENT STUDENTS FROM CIVIL ENGINEERING

S.NO	Course Code	Course Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
1	EBCE22OL1	Building Drawing Practice using Auto CADD	Lb	0	0/0	3/0	1	ID
2	EBCE22OL2	Geographical Information System and Mapping Laboratory	Lb	0	0/0	3/0	1	ID
3	EBCE22OL3	Environmental Engineering Laboratory	Lb	0	0/0	3/0	1	ID

LIST OF FOREIGN LANGUAGES

FOREIGN LANGUAGES								
S.NO	**Course Code**	**Course Title**	**Ty/Lb/ ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	EBFL22I01	French language	IE	1	0/0	0/1	1	HS
2	EBFL22I02	German language	IE	1	0/0	0/1	1	HS
3	EBFL22I03	Japanese language	IE	1	0/0	0/1	1	HS
4	EBFL22I04	Arabic language	IE	1	0/0	0/1	1	HS
5	EBFL22I05	Chinese language	IE	1	0/0	0/1	1	HS
6	EBFL22I06	Russian language	IE	1	0/0	0/1	1	HS
7	EBFL22I07	Spanish language	IE	1	0/0	0/1	1	HS

Table 1: Components of Curriculum and Credit distribution for Civil Engineering

Course Component	Description	No. of Courses	Credits	Total	Credit Weightage (%)	Contact hours
Basic Science	Theory	8	28	28	16.86	450
	Lab	0	0			0
	ETL	0	0			0
Engineering Science	Theory	2	6	6	3.61	120
	Lab	0	0			0
	ETL	0	0			0
Humanities and Social Science	Theory	3	3	4	2.41	90
	Lab	1	1			30
	ETL	0	0			0
Program Core	Theory	15	56	70	42.16	840
	Lab	10	10			450
	ETL	2	4			90
Program Electives	Theory	5	15	15	9.03	225
	Lab	0	0			0
	ETL	0	0			0
Open Elective	Theory	2	6	7	4.21	90
	Lab	1	1			45
	ETL	0	0			0
Inter-disciplinary	Theory	6	10	20	12.04	225
	Lab	4	4			120
	ETL	3	6			135
Skill Component		6	6	6	3.61	165
Project		2	10	10	6.02	90
Others if any		-	-	-	-	-
		70		166	100	3165

Table 2:

Revision/modification done in syllabus content:

S.No	Course (Subject) Code	Course (Subject) Name	Concept/ topic if any, removed in current curriculum	Concept/ topic added in the new curriculum	% of Revision/ Modification done
1	EBCE22003	Hill and Advanced Surveying	-	Curve Setting, Geodetic surveying, field astronomy	60%
2	EBCE22005	Fluid Mechanics and Hydraulic Engineering	Positive displacement pumps, air vessels	-	20%
3	EBCE22L09	Structural Design Studio	-	1. Program for Design of Slabs. Using Excel 2. Program for Design of Beams. Using Excel 3. Program for Design of Column and Footing Using Excel	40%

Table 3:

List of New courses/value added courses/life skills/Electives/interdisciplinary/courses focusing on employability/ entrepreneurship/ skill development.

S.No	New courses (Subjects)	Value added courses	Life skill	Electives	Inter Disciplinary	Focus on employability/ entrepreneurship/ skill development
1	Smart structures and smart materials	Technical skill I – Manual Building Drawing	Universal Human Values 2: Understanding Harmony	Engineering Geology	Orientation to Entrepreneurship and project lab	Hill and Advanced Surveying
2	Advanced Environmental Engineering	Technical Skill II – Survey Camp	The Indian Constitution/ The Indian Traditional Knowledge	Cleaner Production	C Programming and MS office tools	Soft Skill I – Employability skills
3	Fundamentals of nanoscience	Technical Skill III – Detailing of R.C and Steel Structures	Foreign Language	Building Technology and Habitat Engineering	Python programming	Soft Skill II (Qualitative and Quantitative Skills)
4	Online course (NPTEL/SWAYAM/Any online MOOC course approved by AICTE/UGC)			Architecture and Town Planning	Energy Conservation Techniques	Mini Project / Internship
5	Industrial chemistry			Hydrology	Composite Materials	Total Quality Management
6				Environmental Impact Assessment	Water analysis laboratory	Project Phase – I
7				Bridge Structures	Applications of IoT in Civil Engineering	Project Phase – II
8				Irrigation Engineering	Mathematical software for Civil Engineers	Structural design studio
9				Prestressed Concrete Structures	Artificial Intelligence and Machine Learning laboratory	
10				Housing Planning and Design		
11				Industrial Waste Management		
12				Cost Effective		

				Buildings		
13				Structural Dynamics and Earth Quake Engineering		
14				Dam Engineering		
15				Industrial Structures		
16				Advanced Environmental Engineering		
17				Repair and Rehabilitation of Structures		
18				Municipal Solid Waste Management		
19				Finite Element Analysis		
20				Pre Fabricated Structures		

I SEMESTER

Subject Code	Subject Name : **TECHNICAL ENGLISH**	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBEN22001	Prerequisite : Higher Sec. English	**Ty**	**2**	**0/0**	**0/0**	**2**

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

To refresh and stimulate students' English learning through Content Integrated Language Learning to have an in-depth understanding of the components of English language and its use in communication that they are competent in inter-personal and academic communication for a successful career.

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Refresh and stimulate their English learning through Content Integrated Language Learning ming
CO2	Have an in-depth understanding of the components of English language and its use in communication.
CO3	Strengthen their vocabulary and syntactic knowledge for use in academic and technical communication
CO4	Learn to negotiate meaning in inter-personal and academic communication for a successful career
CO5	Engage in organized academic and professional writing for life-long learning and research

Mapping of Course Outcome with Program Outcome (POs)

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

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
			✓						

Subject Code	Subject Name : **TECHNICAL ENGLISH**	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBEN22001	Prerequisite : Higher Sec. English	**Ty**	**2**	**0/0**	**0/0**	**2**

Unit I Vocabulary Development: **6 Hrs**

Affixes: prefixes and suffixes and word formation–synonyms and antonyms-nominal compounds, expanding using numbers and approximation - preposition, prepositional phrases, preposition + relative pronoun- adjective: degrees of comparison, formation of adjectives, irregular comparatives- Infinitive and Gerunds

Unit II Grammar **6 Hrs**

Tenses- auxiliary and modal –voice: active, passive and impersonal passive - Questions: Wh-pattern, Yes/no questions, tag questions – adverbs and adverbial clauses- 'If' clause, 'cause and effect', 'purpose'- Concord: subject-verb agreement

Unit III Reading **6 Hrs**

Comprehension: extracting relevant information from the text, by skimming and scanning and inferring, identifying lexical and contextual meaning for specific information, identifying the topic sentence and its role in each paragraph, comprehension exercises - Note - making - Précis writing-instructions, suggestions and recommendations.

Unit IV Writing **6 Hrs**

Jumbled sentences - paragraph writing coherence devices- discourse markers. Essay writing- Letter writing, Informal and formal: seeking permission to undergo practical training, letter to an editor of a newspaper complaining about civic problems and suggesting suitable solutions

Unit V Visual Aids in Communication **6 Hrs**

Interpretation of diagrams - tables, flow charts, pie charts and bar charts, and their use in Business reports

Total No of Hrs: 30

Text book

Panorama: Content Integrated Language Learning for Engineers, M. Chandrasena Rajeswaran & R.Pushkala,, Vijay Nicole Imprints Pvt. Ltd., Chennai

References

1. Bhatnagar & Bhatnagar, Communicative English for Engineers and Professionals, Pearson
2. Wren and Martin: Grammar and Composition, Chand & Co, 2006
3. https://learnenglish.britishcouncil.org
4. www.better-english.com/grammar/preposition.

Subject Code	Subject Name : **MATHEMATICS-I**	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBMA22001	Prerequisite : Higher secondary Mathematics	Ty	3	1/0	0/0	4

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

- Apply the Basic concepts in Algebra
- Use the Basic concepts in Matrices
- Identify and solve problems in Trigonometry
- Understand the Basic concepts in Differentiation
- Apply the Basic concepts in Functions of Several variables

COURSE OUTCOMES (Cos)
Students completing this course were able to

CO1	Find the summation of given series of binomial ,exponential and logarithmic
CO2	Transform a non-diagonal matrix into an equivalent diagonal matrix using orthogonal transformation
CO3	Find the expansion of trigonometric function into an infinite series and separate real and imaginary parts
CO4	Find the maxima and minima of the given function
CO5	Evaluate the partial/total differentiation and maxima/minima of function of several variable

Mapping of Course Outcome with Program Outcome (POs)

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

3/2/1 Indicates Strength Of Correlation, 3 –High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
	✓								

Subject Code	Subject Name : **MATHEMATICS-I**	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBMA2201	Prerequisite : Higher secondary Mathematics	Ty	3	1/0	0/0	4

UNIT I ALGEBRA 12 Hrs

Binomial, Exponential, Logarithmic Series (without proof of theorems) – Problems on Summation, Approximation and Coefficients.

UNIT II MATRICES 12 Hrs

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley - Hamilton theorem(without proof) – Orthogonal reduction of a symmetric matrix to Diagonal form.

UNIT III TRIGONOMETRY 12 Hrs

Expansions of Sin nθ, Cos nθ in powers of Sinθ and Cosθ–Expansion of Tan nθ– Expansions of $Sin^n\theta$ and $Cos^n\theta$ in terms of Sines and Cosines of multiples of θ – Hyperbolic functions – Separation into real and imaginary parts.

UNIT IV DIFFERENTIATION 12 Hrs

Basic concepts of Differentiation –Elementary differentiation methods –Parametric functions – Implicit function – Leibnitz theorem (without proof) – Maxima and Minima – Points of inflection.

UNIT V FUNCTIONS OF SEVERAL VARIABLES 12 Hrs

Partial derivatives – Total differential – Differentiation of implicit functions – Taylor's expansion – Maxima and Minima by Lagrange's Method of undetermined multipliers – Jacobians.

Total No of Hrs: 60

Text & Reference Books:

1) Kreyszig E., *Advanced Engineering Mathematics (10th ed.)*, John Wiley & Sons, (2011).

2) Grewal B.S., *Higher Engineering Mathematics*, Khanna Publishers, (2012).

3) John Bird, *Basic Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2010).

4) Veerarajan T., *Engineering Mathematics (for first year)*, Tata McGraw Hill Publishing Co., (2008).

5) P.Kandasamy, K.Thilagavathy and K. Gunavathy, *Engineering Mathematics Vol. I (4th Revised ed.)*,S.Chand& Co., Publishers, New Delhi (2000).

6) sJohn Bird, *Higher Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2006).

Subject Code	Subject Name : **ENGINEERING PHYSICS**	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBPH22ET1	**Prerequisite : Higher Sec. Physics**	**ETL**	**2**	**0/0**	**2/0**	**3**

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

- Outline the relation between Science, Engineering & Technology.
- Demonstrate competency in understanding basic concepts.
- Apply fundamental laws of Physics in Engineering & Technology.
- To identify & solve problems using physics concepts.
- Produce and present activities associated with the course through effective technical communication

COURSE OUTCOMES (Cos)
Students completing this course were able to

CO1	Demonstrate competency in understanding basic concepts.
CO2	Utilize scientific methods for formal investigations & demonstrate competency with experimental methods and verify the concept to content knowledge.
CO3	Identify and provide solutions for engineering problems.
CO4	Relate the technical concepts to day to day life and to practical situations.
CO5	Think analytically to interpret concepts.

Mapping of Course Outcome with Program Outcome (POs)

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

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
	✓								

Subject Code	Subject Name : **ENGINEERING PHYSICS**	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBPH22ET1	**Prerequisite : Higher Sec. Physics**	**ETL**	**2**	**0/0**	**2/0**	**3**

UNIT I PROPERTIES OF MATTER **12 Hrs**

Elasticity - stress, strain and Hook's law - Poisson's ratio - three moduli of elasticity - twisting couple on a wire – Shafts – Solid & Hollow Shafts – Bending moment – Youngs Modulus Determination by Non Uniform Bending -I form of girders. viscosity - flow of liquid through a narrow tube: Poiseuille's law (Qualitative) - Ostwald`s viscometer – Lubrication

Lab Component – 1. Coefficient of Viscosity determination using Poiseuille's Method

UNIT II ACOUSTICS & ULTRASONICS **12 Hrs**

Fundamentals of acoustics - reverberation- reverberation time - factors affecting acoustics. Ultrasonics -Production of ultrasonic waves - detection of ultrasonic waves+ - acoustic grating - application of ultrasonic waves.

Lab Component – 2. Ultrasonic Velocity Determination

UNIT III WAVE OPTICS **12 Hrs**

Huygen`s principle - interference of light – wave front splitting and amplitude – air wedge - Newton`s rings - Michelson interferometer and its applications - Fraunhofer diffraction from a single slit - diffraction grating

Lab Component – 3. Spectrometer – Grating

UNIT IV LASER **12 Hrs**

Laser principle and characteristics - amplification of light by population inversion - properties of laser beams: mono-chromaticity, coherence, directionality and brightness - different types of lasers - Ruby laser-Nd-YAG laser-He-Ne laser-CO_2 laser - semiconductor laser - applications of lasers in science, engineering and medicine.

Lab Component – 4. Determination of Wavelength of the given Laser source & Particle Size Determination

UNIT V FIBER OPTIC COMMUNICATION **12 Hrs**

Total Internal Reflection – Propagation of Light in Optical Fibers – Numerical aperture and Acceptance Angle – Types of Optical Fibers (material, refractive index, mode) – Fiber Optical Communication system (Block diagram) – Attenuation–Transmitter, Receiver, Dispersion, Modulation/Demodulation Advantages of Fiber Optical Communication System – IMT, PMT, Wavelength Modulated & Polarization Modulated Sensors – Endoscope Applications.

Lab Component – 5. Determination of Numerical Aperture of Optical Fiber

Total No of Hrs: 60

TEXT BOOKS

1. Brijlal, M. N. Avadhanulu & N. Subrahmanyam, Text Book of Optics, S. Chand Publications, 25th edition, 2012
2. R. Murugeshan, Electricity and Magnetism, S.Chand Publications, 10th edition, 2017
3. R. Murugeshan & Kiruthiga Sivaprasath, Modern Physics, S.Chand Publications, 2016

REFERENCE BOOKS

1. Dr. Senthil Kumar Engineering Physics I VRB Publishers, 2016
2. N Subrahmanyam & Brijlal, Waves and Oscillations, Vikas Publications, New Delhi,1988
3. N Subrahmanyam & Brijlal, Properties of Matter, S. Chand Co., New Delhi, 1982
4. N Subrahmanyam & Brijlal, Text book of Optics, S. Chand Co., New Delhi, 1989
5. R. Murugeshan, Electricity and Magnetism, S. Chand & Co., New Delhi, 1995
6. Thygarajan K & Ajay Ghatak, Laser Theory and Applications, Macmillan, New Delhi, 1988
7. Dr. S. Muthukumaran,Dr.G.Balaji,S.Masilamani - PHYSICS LABORATORY I & II by Sri Krishna Hitech Publishing Company Pvt.Ltd.

Subject Code	Subject Name **ENGINEERING CHEMISTRY**	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBCH22ET1	**Prerequisite : Higher Sec. Chemistry**	**ETL**	**2**	**0/0**	**2/0**	**3**

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

1.To deduce practical application of theoretical concepts
2.To provide and insight into fundamental concepts of chemical thermodynamics
3.To articulate the water treatment methods
4. To impart the knowledge in electrical conductance and EMF
5. To create awareness about the modern Nano composites along with concepts of polymers
6.To introduce analytical tools for characterization techniques**.**

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Apply relevant instrumentation techniques to solve complex problems
CO2	Recall the fundamentals and demonstrate by understanding the first principles of Engineering sciences.
CO3	Examine the appropriate techniques to interpret data to provide valid conclusion
CO4	Demonstrate the collaboration of science and Engineering to recognize the need for life long learning.
CO5	Analyse the impact of contextual knowledge to access the health and society issues.

Mapping of Course Outcome with Program Outcome (POs)

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3	3	3				2			
CO2	3	3				3						3
CO3	3		2	3								
CO4	3	3		3				3				3
CO5	3					2	3	2				3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
	✓								

Subject Code	Subject Name **ENGINEERING CHEMISTRY**	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBCH22ET1	**Prerequisite : Higher Sec. Chemistry**	**ETL**	**2**	**0/0**	**2/0**	**3**

UNIT -I CHEMICAL THERMODYNAMICS 12 Hrs

Introduction, Terminology in thermodynamics –System, Surrounding, State and Path functions, Extensive and intensive properties. Laws of thermodynamics – I and II laws-Need for the II law. Enthalpy, Entropy, Gibbs free energy, Helmholtz free energy - Spontaneity and its criteria. Maxwell relations, Gibbs -Helmholtz equation (relating E & A) and (relating H & G).

UNIT -II TECHNOLOGY OF WATER 12 Hrs

Water quality parameters – Definition and expression. Analysis of water – alkalinity, hardness and its determination (EDTA method only). Boiler feed water and Boiler Troubles-Scales and sludges, Caustic embrittlement, Priming and Foaming and Boiler corrosion. Water softening processes – Internal conditioning, external conditioning – Demineralization methods. Desalination processes-RO and Electrodialysis.

Lab Component-1. Analyze the water quality parameters for the given water sample.

UNIT -III ANALYTICAL AND CHARACTERIZATION TECHNIQUES 12 Hrs

Chromatographic techniques – column, thin layer and paper. Instrumentation-working with block diagram- UV-Visible Spectroscopy , IR Spectroscopy , Scanning electron microscope ,Transmission electron microscope.

Lab Component-2.Determination of Rf values of various components using thin layer chromatography.

3. Compute and interpret the structures of the given molecules using Chem Draw.

UNIT – IV ELECTROCHEMISTRY 12 Hrs

Conductance – Types of conductance and its Measurement. Electrodes and electrode potential, Nernst equation – EMF measurement and its applications-Electrochemical series- Types of electrodes- Reference electrodes-Standard hydrogen electrode- Saturated calomel electrode- Determination of P^H using these electrode.

Lab Component-4. Studies on acid-base conductometric titration.

5. Determination of redox potentials using potentiometry

UNIT -V POLYMERS AND NANO COMPOSITES 12 Hrs

Polymers-Introduction-Monomers – Functionality – Degree of polymerization-Tacticity. Classification- Plastics – Thermoplastics and thermosetting plastics, Compounding of plastics – Compression moulding, injection moulding and extrusion processes. Nano composites: particulates, clay and carbon nano tubes. Graphene nano composites and its applications.

Lab Component-6.Polymeric analysis using capillary viscometer

Total No of Hrs: 60

References

1. Jain &Jain*Engineering Chemistry* 17th Edition, Dhanpat Rai Publishing Company
2. Vasant R. Gowariker,, N. V. Viswanathan, Jayadev Sreedhar, *Polymer Science*,New Age International, 1986
3. B.K. Sharma, *Polymer Chemistry*, Goel Publishing House
4. Y. R. Sharma ,*Elementary Organic Spectroscopy*, S.Chand& Company Ltd.
5. N.Krishnamurthy, K.Jeyasubramanian, P.Vallinayagam, Applied Chemistry, Tata McGraw-Hill Publishing Company Limited, 1999.
6.Chichester,polymer-clay-nano composites,John wiley(2000)

Subject Code	Subject Name : **BASIC ELECTRICAL & ELECTRONICS ENGINEERING**	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBEE22ET1	**Prerequisite : None**	**ETL**	**2**	**0/0**	**2/0**	**3**

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

- Understand the concepts of circuit elements, circuit laws and coupled circuits.
- Gain information on measurement of electrical parameters.
- Acquire knowledge on conventional &non-conventional energy production.
- Identify basic theoretical principles behind the working of modern electronic gadgets.
- Demonstrate digital electronic circuits and assemble simple devices.

COURSE OUTCOMES (Cos)
Students completing this course were able to

CO1	Compute the electric circuit parameters for simple problems
CO2	Elaborate the concepts of Electrical machines and measurement principles
CO3	Identify conventional and Non-conventional Electrical power Generation, Transmission and Distribution
CO4	Analyze the working principles and characteristics of analog electronic devices
CO5	Understand basics of digital electronics and solving problems and design combinational circuits

Mapping of Course Outcome with Program Outcome (POs)

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

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
		✓							

Subject Code	Subject Name : **BASIC ELECTRICAL & ELECTRONICS ENGINEERING**	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBEE22ET1	**Prerequisite : None**	**ETL**	**2**	**0/0**	**2/0**	**3**

UNIT I ELECTRIC CIRCUITS 12 Hrs

Electrical Quantities – Ohms Law – Kirchhoff's Law – Series and Parallel Connections – Current Division and Voltage Division Rule - Source Transformation – Wye (Y) – Delta (Δ) , Delta (Δ) – Wye (Y) Transformation – Rectangular to Polar and Polar to Rectangular

Lab Components – Measurement of Electrical Quantities

UNIT II MACHINES & MEASURING INSTRUMENTS 12 Hrs

Construction & Principle of Operation of DC motor & DC Generator – EMF equation of Generator – Torque Equation of Motor – Construction & Principle of operation of Transformer –Operating principles and Types of measuring instruments – Moving coil, Moving iron – Principle of Energy meter

Lab Component – Measurement of Energy Using energy meter

UNIT III BASICS OF POWER SYSTEM 12 Hrs

Generation of Electric Power (Thermal, Hydro, Wind and Solar) – Basic structure of Power system – Types of Transmission & Distribution Schemes – Representation of Substation.

Lab Component – Residential house wiring
Stair case wiring

UNIT IV ELECTRON DEVICES 12 Hrs

Semiconductor Materials: Silicon and Germanium – PN Junction Diode, Zener Diode – Characteristics and Applications – Bipolar Junction Transistor - JFET, SCR, MOSFET, IGBT –Characteristics and Applications – Operating principle - Rectifiers and Inverters

Lab Component – Resistor colour coding - Resistance Measurement

UNIT V DIGITAL SYSTEM 12 Hrs

Number System – Binary, Decimal, Octal, Hexadecimal – Binary Addition, Subtraction, Multiplication & Division – Boolean Algebra – Reduction of Boolean Expressions – Logic Gates - De-Morgan's Theorem - Adder – Subtractor

Lab Component - Soldering practice
Logic Gates

Total No of Hrs: 60

TEXT BOOKS:

1. D P Kothari, I J Nagrath, 2017, Basic Electrical Engineering, Second Edition, Tata McGraw-Hill Publisher
2. A.K. Sawhney, 2015 A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & CO publisher
3. B.L. Theraja, A.K. Theraja, Text Book of Electrical Technology: Volume 3: Transmission, Distribution and Utilization, S. Chand publisher
4. Morris Mano, M, 2016 Digital Logic and Computer Design, Prentice Hall of India
5. Millman and Halkias 2015, Electronic Devices and Circuits, Tata McGraw Hill

REFERENCE BOOKS:

1. R. Muthusubramanian, S. Salivahanan, K A Muraleedharan, Basic Electrical, Electronics and Computer Engineering, Second Edition, Tata McGraw-Hill publisher

Subject Code	C PROGRAMMING AND MS OFFICE TOOLS	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
EBCS22ET1	Prerequisite: Nil	**ETL**	**1**	**0/0**	**2/0**	**2**

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES :

The student should be made to:

- Learn a programming language.
- Learn problem solving techniques.
- Write programs in C and to solve the problems.
- Familiarize the students in preparation of documents and presentations with office automation tools.

COURSE OUTCOMES (COs) : After Completing the course, the student can be able to

CO1	Understand and trace the execution of programs written in C language.
CO2	Write the C code for a given algorithm.
CO3	Apply Arrays and Functions concepts to write Programs
CO4	Apply Structures and pointers concepts for writing Programs
CO5	To perform documentation , accounting operations and presentation skills

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	1	1	1	1	1	1	2	2
CO2	2	2	2	2	1	1	1	1	1	1	2	2
CO3	2	2	3	2	1	1	1	1	1	1	3	2
CO4	2	2	3	3	1	1	1	1	1	1	3	2
CO5	1	1	1	1	1	1	0	0	2	3	2	0

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓					

Subject Code	C PROGRAMMING AND MS OFFICE TOOLS	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
EBCS22ET1	Prerequisite: Nil	**ETL**	**1**	**0/0**	**2/0**	**2**

UNIT I **Introduction** **3 Hrs**

Basic Structure of C programme- Constants, Variables and data types, Keywords, Identifiers- Operators and expressions- executing a C Program

UNIT II **Decision making statements and looping statements** **3 Hrs**

Decision making with if statement, Simple if statement, else-if statement, Nesting if-else statement, The else if ladder, The switch statement, The goto statement, The while statement,, The do while statement, The for statement, jumps in loops

UNIT III **Arrays and Functions** **3 Hrs**

Introduction to Arrays- One dimensional arrays, Two dimensional array, and Multidimensional array- Introduction to Functions- calling a function, category of functions- arguments with return values, argument with no return values- parameter passing Mechanism: Call by Value and Call by Reference. Recursion.

UNIT IV **Structures & Pointers** **3 Hrs**

Structures definition, giving values to members, Structure initialization, comparison of structure variables, Structure within structures, Understanding pointers, accessing the address of the variable, declaring and initializing pointer, accessing a variable through its pointer and arrays

UNIT V **Ms-Office** **3 Hrs**

Introduction to MS-Word- Menus- Introduction to MS-Excel: features of MS- Excel, spread sheet/worksheet, parts of MS-excel window, functions in excel sheet, chart, Introduction to MS-Power point

Total No of Hrs: 15

TEXT BOOKS:

1. E.Balaguruswamy, Programming in ANSI C
2. Padma Reddy ,Computer Concepts & 'C' Programming
3. ShobhaHangirke, Computer Application For Business

List of Experiments : C PROGRAMMING **30 periods**

1. Find the factorial of a given positive number using function.
2. Calculate X raised to y using function.
3. Find GCD and LCM of two given integer numbers using function.
4. Find the sum of N natural numbers using function.
5. Book information using Structure.
6. Student information using Structure.
7. Print the address of a variable and its value using Pointer
8. Find area and perimeter of a circle
9. Check whether the given number is palindrome or not
10. Check whether the given number is prime or not
11. Calculate sum of the digits of the given number
12. Display Fibonacci series up to N terms
13. Check whether a given character is alphabetic, numeric or special character
14. Count vowels and consonants in a given string
15. Find product of two matrices

MS-OFFICE

16. Preparing a news letter:
17. To prepare a newsletter with borders, two columns text, header and footer and inserting a graphic image and page layout.
18. Creating and editing the table
19. Printing envelopes and mail merge.
20. Using formulas and functions: To prepare a Worksheet showing the monthly sales of a company in different branch offices
21. Prepare a Statement for displaying Result of 10 students in 5 subjects

Subject Code	Subject Name : **ORIENTATION TO ENTREPRENEURSHIP & PROJECT LAB**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBCC22I01	Prerequisite : None	**IE**	**1**	**0/0**	**1/0**	**1**

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

- Understand how entrepreneurship Education transforms individuals into successful leaders.
- Identify individual potential &S have career dreams
- Understand difference between ideas & opportunities
- Identify components & create action plan.
- Use brainstorming in a group to generate ideas.

COURSE OUTCOMES (Cos)
Students completing this course were able to

CO1	Develop a Business plan & improve ability to recognize business opportunity
CO2	Do a self-analysis to build an entrepreneurial career.
CO3	Articulate an effective elevator pitch.
CO4	Analyze the local market environment & demonstrate the ability to find an attractive market
CO5	Identify the required skills for entrepreneurship & develop

Mapping of Course Outcome with Program Outcome (POs)

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

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
							✓		

Subject Code	Subject Name : **ORIENTATION TO ENTREPRENEURSHIP & PROJECT LAB**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBCC22I01	Prerequisite : None	**IE**	**0**	**0/0**	**2/0**	**1**

UNIT I CHARACTERISTICS OF A SUCCESSFUL ENTREPRENEUR 3 Hrs

Introduction to entrepreneurship education – Myths about entrepreneurship – How has entrepreneurship changed the country – Dream it. Do it - Idea planes - Some success stories – Global Legends – Identify your own heroes.

UNITII ENTREPRENEURIAL STYLE 3 Hrs

Entrepreneurial styles – Introduction, concept & Different types - Barrier to Communication – Body language speaks louder than words

UNIT III DESIGN THINKING 3 Hrs

Introduction to Design thinking – Myth busters – Design thinking Process - Customer profiling – Wowing your customer – Personal selling – concept & process – show & tell concept – Introduction to the concept of Elevator Pitch

UNIT IV RISK MANAGEMENT 3 Hrs

Introduction to risk taking & Resilience – Managing risks (Learning from failures, Myth Buster) – Understanding risks through risk takers – Why do I do? – what do I do?

UNIT V PROJECT 3 Hrs

How to choose a topic – basic skill sets necessary to take up a project – creating a prototype – Pitch your project – Project presentation.

IDEA GENERATION, EVALUATION & PROJECT PRESENTATION **15 Hrs**

Total No of Hrs: 30

Reference Books& Website

1. Encyclopedia of Small Business (2011) – (e book)
2. Oxford Handbook of Entrepreneurship (2014) – (e book)
3. lms.learnwise.org

II SEMESTER

Subject Code: **EBMA22003**	Subject Name **: MATHEMATICS-II**	Ty/ Lb/ ETL/IE	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: Higher secondary Mathematics	Ty	3	1/0	0/0	4

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES :

The student should be made to:

To be able to understand basic concepts in integration
To understand the concepts in multiple integrals
To use the basic concepts in ordinary differential equations
To be able to apply concepts of analytical geometry
To be able to understand the basic concept of vector calculus

COURSE OUTCOMES (COs) :

CO1	Integrate the given function by using methods of integration and to find the area under curve and the volume of a solid by revaluation
CO2	Evaluate the multiple integrals /area/volume and to change the order of integration
CO3	Apply concepts in Ordinary Differential equations and to solve eulers differential equation
CO4	Find equation of planes, lines and sphere and shortest distance between skew lines
CO5	Verify green/stokes/gauss divergence theorem

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	2	2	1	2	2	2	1	3
CO2	3	3	1	2	2	3	2	2	3	3	2	2
CO3	3	3	1	2	2	3	1	1	3	3	2	2
CO4	3	3	2	2	1	2	2	2	2	3	2	2
CO5	3	3	1	2	2	2	2	1	2	3	1	2

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
	✓											

Subject Code: **EBMA22003**	Subject Name **: MATHEMATICS-II**	Ty/ Lb/ ETL/IE	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: Higher secondary Mathematics	Ty	3	1/0	0/0	4

UNIT I INTEGRATION 12 Hrs

Basic concepts of Integration – Methods of Integration– Integration by substitution – Integration by parts – Definite integrals– Properties of definite integrals – Problems on finding Area and Volume using single integrals (simple problems).

UNIT II MULTIPLE INTEGRALS 12 Hrs

Double integral in Cartesian and Polar Co-ordinates – Change of order of integration – Triple integral in Cartesian Co-ordinates – Spherical Polar Co-ordinates – Change of variables (simple problems).

UNIT III ORDINARY DIFFERENTIAL EQUATIONS 12 Hrs

First order differential equations – Second and higher order linear differential equations with constant coefficients and with RHS of the form: e^{ax}, x^n, Sin ax, Cos ax, $e^{ax}f(x)$, x f(x) where f(x) is Sin bx or Cos bx – Differential equations with variable coefficients (Euler's form) (simple problems).

UNIT IV THREE DIMENSIONAL ANALYTICAL GEOMETRY 12 Hrs

Direction Cosines and Ratios – Equation of a straight line – Angle between two lines – Equation of a plane – Co-planar lines – Shortest distance between skew lines – Sphere – Tangent plane.

UNIT V VECTOR CALCULUS 12 Hrs

Scalar and Vector functions – Differentiation – Gradient, Divergence and Curl – Directional derivatives – Irrotational and Solenoidal fields– Line, Surface and Volume integrals – Green's, Stoke's and Gauss divergence theorems (statement only) – Verification.

Total No of Hrs: 60

Reference Books:

1) Kreyszig E., *Advanced Engineering Mathematics (10th ed.)*, John Wiley & Sons, (2011).

2) Grewal B.S., *Higher Engineering Mathematics*, Khanna Publishers, (2012).

3) John Bird, *Basic Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2010).

4) Veerarajan T., *Engineering Mathematics (for first year)*, Tata McGraw Hill Publishing Co., (2008).

5) P.Kandasamy, K.Thilagavathy and K. Gunavathy, *Engineering Mathematics Vol. I (4th Revised ed.)*, S.Chand& Co., Publishers, New Delhi (2000).

6) John Bird, *Higher Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2006).

Subject Code	Subject Name : **ENGINEERING MECHANICS**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBPH22002	Prerequisite : Engg. Physics	Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

- Design, conduct experiment and analyze data.
- Develop a Scientific attitude at micro and nano scale of materials
- Understand the concepts of Properties of Matter
- Apply the science of materials to Engineering & Technology

COURSE OUTCOMES (Cos)
Students completing this course were able to

CO1	Articulate a strong foundation in understanding kinematics & Kinetics
CO2	Identify and use the fundamentals of mechanics, static and dynamic equilibrium
CO3	Enhance the problem solving skill in statics and dynamics
CO4	Develop analytical skills to identify different types of motion
CO5	Articulate models to acquire knowledge on mathematical, analytical skills

Mapping of Course Outcome with Program Outcome (POs)

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

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
	✓								

Subject Code	Subject Name : **ENGINEERING MECHANICS**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBPH22002	Prerequisite : Engg. Physics	Ty	2	0/1	0/0	3

UNIT I STATICS 9 Hrs

STATICS OF PARTICLE: Introduction – units and Dimensions – Laws of mechanics – concurrent forces in a plane-resolution and Composition of forces – equilibrium of the particle-resultant force. Forces in space – Equilibrium of a particle in space – Rigid body - Moments and couples -moment of a force about a point and about an axis – Equilibrium of rigid bodies

UNIT II PROPERTIES OF SURFACE AND SOLIDS 9 Hrs

Determination of Area and volume – Determination and derivation of First moment of area (Centroid), Second moment of area (Moment of Inertia) geometrical area Mass moment of inertia and polar moment of inertia. Principal moments of inertia of plane areas

UNIT III FRICTION 9 Hrs

Introduction – Laws of Dry Friction – Coefficient of friction – friction of a body lying on an inclined plane. Application of friction-Ladder friction-Wedge friction-Screw friction.

UNIT IV DYNAMICS OF PARTICLES 9 Hrs

KINEMATICS: Displacement, Velocity-Constant and variable Acceleration, their relationship – linear and curvilinear motion- Projectile motion, relative motion.

KINETICS**:** Linear and Curvilinear motion- Impulse and Momentum, Impact-collision of Elastic bodies. Newton's law-D'Alemberts principle.

UNIT V DYNAMICS OF RIGID BODIES 9 Hrs

KINEMATICS**:** Introduction-Rotation-Linear and Angular Velocity as well as acceleration. General plane motion-Absolute and Relative velocity in plane motion.

KINETICS**:** Relation between Translatory and Rotary motion of the body-Work energy equation of particles –D'Alemberts principle.

Total No of Hrs: 45

TEXT BOOKS & REFERENCE BOOKS

1) R.S.Khurmi. (2008), "*A Textbook of Engineering Mechanics"*, S.Chand & co Ltd.
2) S.Rajasekaran et.al. (2009), "*Fundamentals of Engineering Mechanics"*,Vikas Publishing House Pvt Ltd., 3rd Edition.
3) *Arthur.P.Boresi,Richard.J.Schmidt, "Engineering Mechanics : Statics &Dynamics", Thomson Brooks/Cole,Chennai.*
4) *Palanichamy M.S, Nagan.S, (2001), "Engineering Mechanics – Statics and Dynamics" Tata Mc Graw Hill.*
5) *Beer & Johnson et.al, (2010) "Vector Mechanics for Engineers (Statics and Dynamics)", Tata Mc Graw Hill.*

Subject Code	Subject Name : **INDUSTRIAL CHEMISTRY**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBCH22002	Prerequisite : Engg. Chemistry	Ty	2	0/1	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

OBJECTIVES :
1. To understand and apply the basic concepts of fuels and combustion in automobiles.
2. To analyze the moisture and protein in food through physical and chemical methods.
3.To detect the industrial development aiming at job creators.
4.To demonstrate the operations of pulp and paper Industry.
5. To illustrate the fundamentals of industrial wastewater treatment.

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Reproduce the understanding of industry oriented chemical science
CO2	Analyze the solutions for industry based problems for sustainable development following professional ethics.
CO3	Apply appropriate techniques for industrial development as a resource of life long learning.
CO4	Develop the reasoning nature by the knowledge acquired to assess the health and safety issues.
CO5	Describe the tools used to apply the engineering knowledge

Mapping of Course Outcome with Program Outcome (POs)

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3					3					
CO2	3		3	3								3
CO3	3					2	3					3
CO4	3		3					3				2
CO5	3				3		3					3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
	✓								

Subject Code	Subject Name : **INDUSTRIAL CHEMISTRY**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBCH22002	Prerequisite : Engg. Chemistry	Ty	2	0/1	0/0	3

UNIT – 1 FUELS & COMBUSTION 9 Hrs

Fuels - classification, calorific value, GCV, NCV, Solid fuels-coal – varieties and ranking, analysis –Proximate Carbonisation of coal, Coke –manufacture , Beehive coke oven method, Otto Hoffmann method – recovering by - products - Liquid fuels – petrol –refining-cracking- thermal & catalytic , Synthetic petrol – Hydrogenation of coal (Fischer Tropsch Process and Bergius process) – Polymerization, Knocking properties of Gasoline –octane number, cetane number – Ignition lag, Leaded petrol, Reforming, Gaseous fuels- manufacture and uses Combustion - Flue gas analysis – Orsat apparatus.Alternative fuel-Electric vehicles

UNIT- 2 FOOD ANALYSIS 9 Hrs

Food analysis-Introduction. Moisture Analysis-Introduction-Moisture content of foods-Sample collection and handling-Forms of water in foods- Distillation procedure-Reflux distillation with immiscible solvent,-Physical methods-Direct method-Hydrometer, -Refractometry –Chemical method-Karl Fischer titration- Protein analysis-Kjeldahl method-Dumas combustion method.

UNIT – 3 APPLICATIONS IN PAPER INDUSTRY 9 Hrs

Introduction-Manufacture of pulp-Mechanical process-Chemical process-Beating,Refining,Filling,Sizing and Colouring-Manufacture of paper-Calendering-Bagasse utilization in paper industry.

UNIT – 4 BUSINESS CHEMICALS 9 Hrs

Toiletry formulations-Soaps and detergent, shampoo, Shaving cream, production. Preparation of cosmetics-moisturizing cream, talcum powder, Nail enamel, Lipstick. Disinfectants- phenyl, hand sanitizer,bleach,caustic soda,naphthalene balls production.

UNIT – 5 INDUSTRIAL WASTES AND TREATMENT PROCESS 9 Hrs

Introduction-Characteristics of industrial waste-Types of industrial wastes-Solid industrial wastes-Principles of industrial waste treatment-Treatment and disposal of industrial waste-Sanitary-Chemical analysis of industrial effluents or sewage-Method of treating industrial sludge.

Total No of Hrs: 45

References

1. Rama Rao Nadendla,*Principles of Organic Medicinal Chemistry*, New Age International (P) Limited, Publishers.
2. H.D.Belitz, W.Grosch,P.Schieberle ,*Food Chemistry* Springer
3. Industrial chemistry by B.K.Sharma,Krisna Prakashan Media(P) Ltd,Publishers.
4. Industrial Chemistry – C. S. Unnithan, T. Jayachandran & P. Udhayakala, Sree Lakshmi Publications - 2010
5. John A.Tyrell, *Fundamentals of Industrial Chemistry* , , Wiley.
6. Ernest M. Flick, *Cosmetic and Toiletry Formulations*, 2nd Edition, Volume 8, Noyes Publications, William Andrew Publishing, LLC.

Subject Code	Subject Name : **ENGINEERING GRAPHICS**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBME22001	Prerequisite : None	TY	2	0/0	2/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

- To acquire knowledge in geometrical drawing.
- To expose the students in computer aided drafting**.**

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Utilize the concept of Engineering Graphics Techniques to draft letters, Numbers, Dimensioning in Indian Standards
CO2	Demonstrate the drafting practice visualization and projection skills useful for conveying ideas in engineering applications.
CO3	Identify basic sketching techniques of engineering equipments
CO4	Demonstrate the projections of Points, Lines, Planes and Solids. And
CO5	Draw the sectional view of simple building drawing.

Mapping of Course Outcome with Program Outcome (POs)

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

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
		✓							

Subject Code	Subject Name : **ENGINEERING GRAPHICS**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBME22001	Prerequisite : None	TY	2	0/0	2/0	3

CONCEPTS AND CONVENTIONS (Not for examination) 3 Hrs

Introduction to drawing, importance and areas of applications – BIS standards – IS: 10711 – 2001 : Technical products Documentation – Size and layout of drawing sheets – IS 9606 – 2001: Technical products Documentation – Lettering – IS 10714 & SP 46 – 2003: Dimensioning of Technical Drawings – IS : 15021 – 2001 : Technical drawings – Projections Methods – drawing Instruments, Lettering Practice – Line types and dimensioning – Border lines, lines title blocks Construction of polygons – conic sections – Ellipse, Parabola, Hyperbola and cycloids.

UNIT I PROJECTION OF POINTS, LINES AND PLANE SURFACES 12 Hrs

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – projection of polygonal surface and circular lamina in simple position only.

UNIT II PROJECTION OF SOLIDS 9 Hrs

Projection of simple solids like prism, pyramid, cylinder and cone in simple position

Sectioning of above solids in simple vertical position by cutting plane inclined to any one of the reference plane and perpendicular to the other.

UNIT III DEVELOPMMENT OF SURFACES 6 Hrs

Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders, and cones.

UNIT IV ISOMETRIC PROJECTION 6 Hrs

Principles of isometric projection – isometric scale – isometric projections of simple solids, like prisms pyramids, cylinders and cones.

UNIT V ORTHOGRAPHICS PROJECTIONS 6 Hrs

Orthographic projection of simple machine parts – missing views

BUILDING DRAWING 3 Hrs

Building components – front, Top and sectional view of a security shed.

(Basic Auto CAD commands to be taught- not for Examinations)

Total No of Hrs: 45

Note: First angle projection to be followed.

TEXT BOOKS

1. Bhatt, N.D. and Panchal, V.M. (2014) Engineering Drawing Charotar Publishing House
2. Gopalakrishnan, K.R. (2014) Engineering Drawing (Vol.I& II Combined) Subhas Stores, Bangalore.
3. Natrajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.
4. Venugopal K. and Prabhu Raja V., “Engineering Graphics", New Age International (P) Limited, 2008.

Subject Code: EBCE22001	**Subject Name: SMART STRUCTURES AND SMART MATERIALS**	**C**	**L**	**T/SLr**	**P/R**
	Prerequisite: None	**3**	**0**	**0**	**3**

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

- This course is designed to give an insight into the latest developments regarding smart materials and their use in structures.

COURSE OUTCOMES (COs): (3 – 5)

Students completing the course were able to

CO1	Understand various smart material and its importance in engineering application
CO2	Understand the physical principles underlying the behavior of smart materials
CO3	Analyse the engineering principles in smart sensor, actuator and transducer Technologies
CO4	Use principles of measurement, signal processing, drive and control techniques necessary to develop smart structures and products
CO5	Suggest improvement on the design, analysis, manufacturing and application issues involved in integrating smart materials and devices with signal processing and control capabilities to engineering smart structures and products

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	3	2	3	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-	-
CO3	-	3	2	3	3	-	-	-	-	-	-	-
CO4	-	-	3	3	-	-	-	-	-	-	-	-
CO5	3	3	3	3	-	-	-	-	-	-	-	-

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

COs/PSOs	**PSO1**	**PSO2**
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
				✓					

Subject Code: EBCE22001	Subject Name: SMART STRUCTURES AND SMART MATERIALS	C	L	T/SLr	P/R
	Prerequisite: None	3	0	0	3
C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation					

UNIT I INTRODUCTION 9 Hrs

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

UNIT II MEASURING TECHNIQUES 9 Hrs

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

UNIT III SENSORS 9 Hrs

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT IV ACTUATORS 9 Hrs

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

UNIT V SIGNAL PROCESSING AND CONTROL SYSTEMS 9 Hrs

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non- Linear.

Total No of Hrs: 45

TEXT BOOKS

1. Brain Culshaw – Smart Structure and Materials Artech House – Borton. London-1996.

REFERENCES

1. L. S. Srinath – Experimental Stress Analysis – Tata McGraw-Hill, 1998.
2. J. W. Dally & W. F. Riley – Experimental Stress Analysis – Tata McGraw-Hill, 1998.

Subject Code	Subject Name : **COMMUNICATIVE ENGLISH LAB**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBCC22I02	Prerequisite : Pass in Plus 2 English	**IE**	**1**	**0/0**	**1/0**	**1**

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

- To engage students in meaningful oral English communication and organized academic and professional reading and writing for a successful career.

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Engage in meaningful oral communication in English with writing as a scaffolding activity.
CO2	Have an in-depth understanding of the components of English language and its use in oral communication.
CO3	Strengthen their vocabulary and syntactic knowledge for use in academic and technical communication
CO4	Learn to negotiate meaning in inter-personal and academic communication for a successful career.
CO5	Engage in organized academic and professional writing for life-long learning and research

Mapping of Course Outcome with Program Outcome (POs)

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

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
			✓						

Subject Code	Subject Name : **COMMUNICATIVE ENGLISH LAB**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBCC22I02	Prerequisite : Pass in Plus 2 English	**IE**	**1**	**0/0**	**1/0**	**1**

Unit I **Listening** **6 Hrs**

Authentic audios and videos

Prescribed Book: English Pronunciation in use – Mark Hancock,

Unit II **Speaking** **6 Hrs**

Individual- Solo: Self introduction, Describing, anchoring, welcome address, vote of thanks,

Pair & Group: Role play- formal -informal, narrating stories, film review, analysing newspaper headings and reports, interpreting Advertisement pamphlets

Group discussion, mock interviews, formal presentation, power point presentation

Prescribed Book: J. C. Richards with J. Hull &S.Proctor, Interchange, Cambridge University Press, 2015.

Unit III **Reading** **6 Hrs**

Extensive, focused reading,

Strategies for effective reading - Reading comprehensions – Note making- summarising- paraphrasing, Review

Suggested reading: Short stories, news paper reports, film reviews

Unit IV **Writing** **6 Hrs**

Extensive writing practices – note taking, Cognitive and metacognitive strategies to inculcate a sense of organising ideas into coherent sentences and paragraphs, Formal letters, Business letters. Resume with covering letter

Unit V **Non verbal communication/ charts, diagrams and table** **6 Hrs**

Interpretation of charts Flow chart, pie chart, bar diagram, table, tree diagram, etc.,

Total No of Hrs: 30

Prescribed Text:

1. J. C. Richards with J. Hull &S.Proctor, Interchange, Level 2, Cambridge University Press, 2021.
2. M. Chandrasena Rajeswaran & R.Pushkala, English - Communication Lab Work book

Reference

1. Hancock, Mark, English Pronunciation in Use; Cambridge Univ. Press, 2013
2. Dutt, K, Rajeevan, G & Prakash, CLN 2008, *A Course on Communication Skills,* 1st edn, Cambridge University Press, Chennai

Subject Code	**PYTHON PROGRAMMING**	Ty/ Lb/ ETL/IE	**L**	**T / S.Lr**	**P/ R**	**C**
EBCS22ET2	Prerequisite: EBCS22ET1	**ETL**	1	0/0	2/0	2

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE : The student should be made to:

- Develop a basic understanding of *programming* and the *Python programming* language
- Write programs in Python to solve real world problems
- See the value of *programming* in a variety of different disciplines,especially as it relates in engineering.

COURSE OUTCOMES (COs) : After Completing the course, the student can be able to

CO1	Remember the syntax and semantics of python programming language
CO2	Understand how functional and operations are to be utilized
CO3	Apply the fundamental programming constructs like variables, conditional logic, looping, and functions to build basic programs
CO4	design object-oriented programs with Python classes
CO5	Apply the knowledge to solve various real world problems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	2	1	1	1	1	0	1	1
CO2	3	2	2	2	2	1	1	1	1	0	1	1
CO3	3	2	2	2	2	1	1	1	1	0	1	1
CO4	3	3	3	2	2	1	2	0	2	0	2	2
CO5	3	3	3	3	2	1	2	0	2	0	2	2

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓					

Subject Code	PYTHON PROGRAMMING	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCS22ET2	Prerequisite: EBCS22ET1	**ETL**	1	0/0	2/0	2

UNIT I: INTRODUCTION **9 Hrs**

History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT II: TYPES, OPERATORS AND EXPRESSIONS **9 Hrs**

Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.

UNIT III: FUNCTIONS **9 Hrs**

Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

UNIT IV:LISTS, TUPLES, DICTIONARIES **9 Hrs**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V: OBJECT ORIENTED PROGRAMMING OOP IN PYTHON **9 Hrs**

Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding.

Total No of Hrs: 45

TEXT BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
2. Think Python:How to Think Like a Computer Scientist'', 2nd edition Updated for Python 3, Shroff/O'Reilly Publishers,Allen B. Downey
3. Learning Python, Mark Lutz, Orielly.

REFERENCE BOOKS:

1. Core Python Programming, W.Chun, Pearson.
2. Introduction to Python, Kenneth A. Lambert, Cengage.

List of Experiment : Python Programming.

1. Develop a python program to find the area and circumference of a circle.
2. Develop a python program to check if the number is positive or negative or zero using nested if else statement.
3. Develop a python program to find the GCD (Greatest Common Divisor) of two numbers.
4. Develop a Python program using function to compute the factorial of a given number.
5. Develop a Python program to find the sum of square of individual digits of a number using function.
6. Develop a Python program to find the largest digit from a number using function.
7. Develop a Python program to display only the positive elements of the list.
8. Develop a Python program to accept any number and print it in words.
9. Develop a Python program to subtract two matrices.
10. Develop a Python program to perform matrix multiplication.

Subject Code:	Subject Name: ENVIRONMENTAL SCIENCE (AUDIT COURSE)	Ty/ Lb/ ETL /IE	L	T/SL	P/ R	C
EBCC22I03	Prerequisite: None	**IE**	**1**	**0**	**1/0**	**0**

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

- To acquire knowledge of the Environment and Ecosystem & Biodiversity
- To acquire knowledge of the different types of Environmental pollution
- To know more about Natural Resources
- To gain understanding of social issues and the Environment
- To attain familiarity of human population and Environment

COURSE OUTCOMES (COs): (3 – 5)

Students completing the course were able to

CO1	Know about Environment and Ecosystem & Biodiversity
CO2	Comprehend air, water, Soil, Marine, Noise, Thermal and Nuclear Pollutions and Solid Waste management and identify the importance of natural resources like forest, water, and food resources
CO3	Discover water conservation and watershed management
CO4	Identify its problems and concerns climate change, global warming, acid rain, ozone layer depletion etc.,
CO5	Explain family welfare programmes and role of information technology in human health and environment

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1						2	3	2				1
CO2						2	3			2		1
CO3						2	3	2				1
CO4						2	3	2		2		1
CO5						2	3			2		1

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project
			✓						

Subject Code:	Subject Name: ENVIRONMENTAL SCIENCE (AUDIT COURSE)	Ty/ Lb/ ETL/IE	L	T/SL	P/ R	C
EBCC22I03	Prerequisite: None	IE	1	0	1/0	0

UNIT I ENVIRONMENT AND ECOSYSTEM 3 Hrs

Definition, Scope and Importance of environment – need for public awareness – concept, structure and function of an ecosystem- producers, consumers and decomposers – energy flow in the ecosystem. Biodiversity at national and local levels – India

UNIT II ENVIRONMENT POLLUTION 3 Hrs

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Nuclear hazards (g) E-Wastes and causes, effects and control measures

UNIT III NATURAL RESOURCES 3 Hrs

Forest resources: Use and over-exploitation, deforestation. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 3 Hrs

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 3 Hrs

Population growth, variation among nations – population explosion, environment and human health – human rights – value education – HIV/AIDS – women and child welfare – role of information technology in environment and human health

(A) AWARENESS ACTIVITIES: 15 Hrs

i) small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
ii) Slogan making event
iii) Poster making event
iv) Cycle rally
v) Lectures from experts

(B) ACTUAL ACTIVITIES:

i) Plantation
ii) Gifting a tree to see its full growth
iii) Cleanliness drive
iv) Drive for segregation of waste
v) To live some big environmentalist for a week or so to understand his work
vi) To work in kitchen garden for mess
vii) To know about the different varieties of plants
viii) Shutting down the fans and ACs of the campus for an hour or so

TEXT BOOKS

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGrawHill,NewDelhi, (2006).

REFERENCES

1. *Vairamani, S. and Dr. K. Sankaran.* ***Elements of Environmental and Health Science.****Karaikudi: KPSV Publications, 5th Edition, July 2013.*
2. *Ifthikarudeen, Etal,* ***Environmental Studies****, Sooraj Publications,2005.*
3. *R.Murugesan,* ***Environmental Studies,*** *Millennium Publishers and Distributors, 2nd Edition, July, 2009.*

III SEMESTER

Subject Code **EBMA22005**	Subject Name **: Mathematics III for Mechanical and Civil Engineers**	**Ty/ Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: First year Engineering Mathematics	Ty	3	1	0	4

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

The student should be made to:

To be able to apply the concepts in Differential Equations
To understand the concepts in Fourier series
To analyze the Problems in wave equations
To analyze the problems in Heat equations.
To understand the concepts in Laplace and Fourier Transforms

COURSE OUTCOMES (COs) :

CO1	To understand the concepts of Partial Differential equations
CO2	To be able to find fourier series solutions
CO3	To be able to apply the concepts of PDE in Wave and Heat problems
CO4	To be able to apply laplace transforms
CO5	To be able to apply Fourier transforms

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	3	3	1	1	2	2	1	1	2
CO2	2	2	1	3	1	2	1	2	3	1	1	2
CO3	3	2	1	3	2	3	2	1	1	2	1	3
CO4	3	2	1	2	1	3	2	1	1	1	1	2
CO5	3	3	1	2	1	2	2	1	1	2	2	3

COs / PSOs	**PSO1**	**PSO2**		
CO1	3	3		
CO2	3	3		
CO3	3	3		
CO4	3	3		
CO5	3	3		

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
	✓											

Subject Code **EBMA22005**	Subject Name **: Mathematics III for Mechanical and Civil Engineers**	**Ty/ Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: First year Engineering Mathematics	Ty	3	1	0	4
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12 Hrs

Formation of PDE by eliminating arbitrary constants and eliminating arbitrary functions – Solutions of standard types of first order equations – Lagrange's equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT II FOURIER SERIES 12 Hrs

Dirichlet's conditions – General Fourier series – Half range Sine & Cosine series – Complex form of Fourier series – Parseval's identity – Harmonic Analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12 Hrs

Classification of second order linear partial differential equations – Solutions of one dimensional wave equation, one-dimensional heat equation – Steady state solution of two dimensional heat equation (Cartesian coordinates only) – Fourier series solutions.

UNIT IV LAPLACE TRANSFORMS 12 Hrs

Transforms of simple functions – Properties of Transforms – Inverse Transforms – Transforms of Derivatives and Integrals – Periodic functions – Initial and final value theorems – Convolution theorem – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients and Linear simultaneous differential equations of first order with constant coefficients.

UNIT V FOURIER TRANSFORMS 12 Hrs

Statement of Fourier integral theorem – Fourier transform pairs – Fourier Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's theorem.

Total no. of hrs: 60

Reference Books:

1) Veerarajan T., *Engineering Mathematics (for first year),* Tata McGraw Hill Publishing Co., (2008).

2) Veerarajan T., *Engineering Mathematics (for semester III),* Tata McGraw Hill Publishing Co., (2005).

3) Singaravelu, *Transforms and Partial Differential Equations*, Meenakshi Agency, (2017).

4) Kreyszig E., *Advanced Engineering Mathematics (9 th ed.)*, John Wiley & Sons, (2011).

5) Grewal B.S., *Higher Engineering Mathematics*, Khanna Publishers, (2012).

Subject Code: EBCE22002	Subject Name : MECHANICS OF SOLIDS	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Mechanics	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn fundamental concepts of Stress, Strain and deformation of soild applications of bars and thin cylinders
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
- To understand the effect of torsion on shafts and springs.
- To analyze a complex two dimensional state of stress and plane trusses

COURSE OUTCOMES (COs) : (3- 5)

CO1	To learn the fundamental concepts of stress and strain in the design of various structural components and machines
CO2	To understand the mechanism of load transfer in beams, the induced stress resultants and deformations
CO3	To apply the bending and shear principles to determine the bending, shear stresses and deflection produced in a beam subjected to system of loads
CO4	To analyze the forces in Trusses using different methods and design shafts for the given load
CO5	To evaluate the stresses due to impact and suddenly applied loads

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	2	1	1	1	1	1	3
CO2	3	3	3	3	1	2	1	1	1	1	1	3
C03	3	3	3	3	1	2	1	1	1	1	1	3
C04	3	3	3	3	1	2	1	1	1	1	1	3
C05	3	3	3	3	1	2	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
C03	3	3
C04	3	3
C05	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22002	Subject Name : MECHANICS OF SOLIDS	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Mechanics	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION TO FORCE CONCEPT 12 Hrs

Equivalent system of forces, rigid bodies, external & internal forces-Application of Statics of Particles-Free body Diagram Concurrent & Non Concurrent Forces - Principles of transmissibility- Equivalent forces & Varignon's theorem. Tension, Compression and Shear stress – Lateral Strain- Poisson's Ratio- Volumetric Strain – Deformation of Simple and Compound Bars - Elastic constants – Composite Sections .

UNIT II CENTRE OF GRAVITY AND MOMENT OF INERTIA 12 Hrs

Areas and volumes - Centroid of simple areas and volumes by integration - Centroid of composite areas - Second moment of areas - Radius of Gyration - Parallel axis and Perpendicular axis theorems - Moment of Inertia of simple areas by Integration -Moment of Inertia of Composite Areas - Mass Moment of Inertia of thin plates and simple solids.

UNIT III BENDING MOMENT & SHEAR FORCE 12 Hrs

Introduction to Bending and S.F- Beams and support conditions – types of supports – types of loads - shear forces and bending moment diagrams for simply supported beams, cantilevers and overhanging beams with all loads.

UNIT IV ANALYSIS OF STATICALLY DETERMINATE PLANE TRUSSES 12 Hrs

Stability and equilibrium of plane frames – Perfect frames - Types of Trusses – Analysis of forces in trusses member – Method of joints – Method of Sections – Tension co-efficient method – Graphical method

UNIT V BENDING STRESS IN BEAMS & TORSION OF SHAFTS 12 Hrs

Theory of simple bending-expression for bending stress-Section modulus-bending stress in symmetrical sections-Theory of torsion-Torsion of circular, hollow circular shafts and power -close coiled helical springs and leaf springs

Total No of Hours: 60

TEXT BOOKS

1. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007. 2.
2. Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010
3. Dr.R.K.Bansal A text book of Strength of Materials, Laxmi Publications,New Delhi 1996.
4. S. Ramamirutham and R.Narayanan, Strength of Materials, Dhanpat Rai Publications, New Delhi,1989.

REFERENCES

1. *Kazimi S.M.A. " Solid Mechanics ", Tata McGraw Hill Publishing Company, New Delhi, 1991.*
2. *Laudner T.J. and Archer R.R., " Mechanical of Solids in Introduction ",McGraw Hill International Editions*
3. *William A.Nash, " Theory and Problems of Strength of Material" Schaum's outline series, Mc Graw Hill International Editions 1994*

Subject Code: EBCE22003	**Subject Name :** HILL AND ADVANCED SURVEYING	**Ty/ Lb/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: None	**Ty**	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To introduce the principles of various surveying methods and applications to Civil Engineering projects

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Understand the principles of basic survey instruments in civil engineering fields, concept of contouring and the ways of plotting.
CO2	Understand the concept of tachometric surveying, Control surveying, Survey adjustments, Astronomical surveying and Photogrammetric.
CO3	Understand the concept Photogrammetry, Total station, Hydrographic survey and cartography.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	2	-	1	-	-	3	-	-	-
CO2	3	2	-	2	-	1	-	-	3	-	-	-
CO3	3	2	-	2	-	1	-	-	3	-	-	-

COs / PSOs	**PSO1**	**PSO2**
CO1	3	3
CO2	3	3
CO3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22003	Subject Name : HILL AND ADVANCED SURVEYING	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	**Ty**	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

Course Objective:

The main objectives of the course are

- To make students aware with different advance surveying methodologies applied to carry out large scale survey works as modern instruments have largely changed the approach to survey works with the principles being same.
- To prepare the students to handle the errors they are likely to come across any large scale survey works.

UNIT I : INTRODUCTION OF CHAIN SURVEYING COMPASS SURVEYING 8 Hrs

Definition - principles - classification - survey instruments - ranging and chaining - reciprocal ranging - setting perpendiculars –errors - traversing. Prismatic compass - surveyor's compass - bearing - systems and conversions - local attraction – magnetic declination - dip - adjustment of error

UNIT II TACHEOMETRIC SURVEYING 8 Hrs

Introduction, purpose, principle & use of tacheometry, Instrument used & stadia hairs & Fixed hair methods of tacheometry, Tacheometry constant & Problems Anallatic lens theory, subtense bar, Field work in tacheometry. Reduction of readings, errors and precisions. Difference between Theodolite & Tacheometer.

UNIT III GEODETIC SURVEYING 9 Hrs

Introduction & object of Geodetic Surveying, Principal & classification of triangulation system, Selection of base line and stations, Orders of triangulation-triangulation figures, Station marks and signals-marking signals, Examples on Phase error, Extension of base, reduction of centre, selection and marking of stations

UNIT IV CONTOURING AND CURVE SETTING 12 Hrs

Contouring - methods –characteristics and uses of contours - plotting - calculation of areas and volumes- earth work volume- Types of curves used in roads and railway alignments-Notations of simple circular curve Designation of the curve-Setting simple circular curve by offsets from long chord and Rankines method of deflection angles

UNIT V FIELD ASTRONOMY 8 Hrs

Introduction & Instruments & purpose, Astronomical terms, Time & conversion of time, Abbreviations, Determination of azimuth , Latitude and longitude & Examples of azimuth , Latitude and longitude

Total No of Hours: 45

Text Books

1. Arora, K.R., Surveying Vol. I, II & III, Standard Book House. New Delhi
2. Basak, N.N., Surveying and Levelling, Tata Mcgraw Hill, New Delhi
3. Agor, R., Surveying and Levelling, Khanna Publishers, New Delhi

Reference Books:

1. Duggal, S. K., Surveying Vol. I & II, Tata Mcgraw Hill, New Delhi
2. Subramanian, R., Surveying & Levelling, Oxford University Press, New Delhi
3. Punamia, B.C., Surveying Vol. I, II & III, Laxmi Publications
4. Kanetkar, T.P. and Kulkarni, S.V., Surveying and Levelling Vol. I & II, Pune VidhyarthiGruh

Subject Code: EBEE22ID7	Subject Name : ENERGY CONSERVATION TECHNIQUES	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: First Year Physics	Ty	3	0/0	0/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the various energy saving and management techniques applied to building and construction with relevance to environment.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course the student shall

CO1	Possess knowledge on basic energy conservation systems
CO2	Understand the concept of energy efficiency and energy conservation measures
CO3	Apply the concept of energy efficiency for constructing smart and green buildings
CO4	Analyze the consumption of energy by conducting energy audit and identify conservative measures
CO5	Design energy efficient buildings

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓					

Subject Code: EBEE22ID7	Subject Name : ENERGY CONSERVATION TECHNIQUES	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: First Year Physics	Ty	3	0/0	0/0	2
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION 9 Hrs

Fundamentals of energy- Energy Production Systems-Heating, Ventilating and Airconditioning – Solar Energy and Conservation – Energy Economic Analysis – Energy conservation and audits – Domestic energy consumption – savings - challenges –primary energy use in buildings - Residential – Commercial – Institutional and public buildings – Legal requirements for conservation of fuel and power in buildings.

UNIT II ENVIRONMENTAL ASPECTS 9 Hrs

Energy and resource conservation – Design of green buildings – Evaluation tools for building energy – Embodied and operating energy – Peak demand – Comfort and Indoor Air quality – Visual and acoustical quality – Land, water and materials ..

UNIT III DESIGN 9 Hrs

Natural building design consideration – Energy efficient design strategies – Contextual factors – Longevity and process Assessment – Renewable Energy Sources and design – Advanced building Technologies – Smart buildings – Economies and cost analysis.

UNIT IV SERVICES 9 Hrs

Energy in building design – Energy efficient and environment friendly building – Thermal phenomena – thermal comfort – Indoor Air quality – Climate, sun and Solar radiation, - Psychometrics – passive heating and cooling systems - Energy Analysis – Active HVAC systems - Preliminary Investigation – Goals and policies – Energy audit – Types of Energy audit– Energy flow diagram – Energy consumption / Unit Production – Identification of wastage- Priority of conservative measures.

UNIT V ENERGY MANAGEMENT 9 Hrs

Energy management of electrical equipment - Improvement of power factor – Management of maximum demand – Energy savings in pumps – Fans – Compressed air systems – Energy savings in Lighting systems – Air conditioning systems – Applications .

Total No. of Hours: 45

REFERENCES

1. *Moore F., Environmental Control system Mc Graw Hill, Inc. 1994.*
2. *Brown, GZ, Sun, Wind and light: Architectural design strategies, John Wiley & Sons,1985.*
3. *Cook, J, Award – Winning passive Solar Design, Mc Graw Hill, 1984.*
4. *J.R. Waters, Energy conservation in Buildings: A Guide to part L of the Building Regulations, Blackwell Publishing, 2003.*

Subject Code: EBME22ID2	Subject Name : COMPOSITE MATERIALS	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Industrial Chemistry	Ty	3	0/0	0/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

Students will learn

- Different composites and their manufacturing methods
- Design parameters of composites
- To gain knowledge in need and applications of composite materials

COURSE OUTCOMES (COs) : (3- 5)

CO1	Aware of different composites and their manufacturing methods
CO2	Know the mechanics and performance of composite materials
C03	Understand the design parameters of composites

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	3	-	-	3	-	3	-	-	2
CO2	2	2	2	3	-	-	-	-	3	-	-	2
CO3	2	2	2	3	-	-	3	-	3	-	-	2

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓					

Subject Code: EBME22ID2	Subject Name : COMPOSITE MATERIALS	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Industrial Chemistry	Ty	3	0/0	0/0	2
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT- I INTRODUCTION 9 Hrs

Limitations of Conventional Materials- Definition of Composite Materials- Types and Characteristics Applications.

UNIT- II MATERIALS 9 Hrs

Fibers- Materials- Fiber Reinforced Plastics- Thermo set Polymers- Coupling Agents, Fillers and Additives- Metal Matrix and Ceramics Composites.

UNIT- III MANUFACTURING 9 Hrs

Fundamentals- bag moulding- compression moulding pultrusion- filament winding- other manufacturing process- quality inspection and non-destructive testing.

UNIT- IV MECHANICS AND PERFORMANCE 9 Hrs

Introduction to Micro-mechanics- Unidirectional Lamina-Laminates- Inter laminar Stress- Statics Mechanical Properties- Fatigue Properties- Impact Properties- Environmental Effects- Fracture Mechanics and Toughening mechanisms, Failure Modes

UNIT- V DESIGN 9 Hrs

Failure Predictions- Design Considerations- Joint Design- Codes- Design Examples. Optimization of Laminated Composites- Application of FEM for Design.

Total No. of Hrs: 45

TEXT BOOKS

1. P.K.Mallick, (2006) "Fiber-Reinforced Composites", Monal Deklatr Inc., New York.
2. B.D.Agrawal and L.J.Broutmam, (2006) "Analysis and Performance of Fiber Composites", John Wiley and Sons,
New York.

REFERENCES

1. *Micael hyer, (1998) "Stress Analysis of Fiber- Reinforced Composite Materials", Tata McGraw Hill.*
2. *Ronald Gibson, (2007) "Principles of Composite Material Mechanics", Tata McGraw Hill.*

Subject Code: **EBCC22ET1**	Subject Name: **UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY**	**Ty/ Lb/ ETL/ IE**	**L**	**T/SLr**	**P/R**	**C**
	Prerequisite: None, UHV1 (Desirable)	**ETL**	**1**	**0/0**	**2/0**	**2**

L:LectureT :Tutorial SLr: Supervised Learning P:Project R:ResearchC:CreditsT/L/ETL: Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

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

1. Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

COURSEOUTCOMES(COs) :(3–5) The students will be able to

CO1	Relate self and surroundings and identify responsibility in life
CO2	Associate human relationship and nature to handle problems and provide sustainable solutions
CO3	Develop critical ability and engage in reflective and independent Thinking
CO4	Show commitment towards understanding of values
CO5	Apply Human values in day to day setting in real life

Mapping of Course Outcomes with Program Outcomes(POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	
CO1	-	-	1	1	-	2	1	-	1	1	-	2	
CO2	-	-	2	2	1	2	3	1	-	2	-	2	
CO3	-	-	1	1	1	2	-	-	1	2	-	3	
CO4	-	-	2	-	1	1	1	3	1	1	-	3	
CO5	-	-	1	-	-	2	1	2	1	1	-	3	

COs/PSOs	**PSO1**	**PSO2**	
CO1	3	3	
CO2	3	3	
CO3	3	3	
CO4	3	3	
CO5	3	3	

3/2/1indicates strength of correlation3 –High,2–Medium,1– Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives		Open Electives	Interdisciplinary	Skill component	Practical / Project
			✓					✓		

Subject Code: **EBCC22ET1**	Subject Name: **UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY**	**Ty/ Lb/ ETL/ IE**	**L**	**T/SLr**	**P/R**	**C**
	Prerequisite: None, UHV1 (Desirable)	**ETL**	**1**	**0/0**	**2/0**	**2**
L:LectureT :Tutorial SLr: Supervised Learning P:Project R:ResearchC:CreditsT/L/ETL: Theory/Lab/Embedded Theory and Lab						

UNIT I **9 Hrs**

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

Purpose and motivation for the course, recapitulation from Universal Human Values-I - Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation-as the process for self-exploration. – Continuous Happiness and Prosperity-A look at basic Human Aspirations - Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority – Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario – Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT II **9 Hrs**

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. - Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). - Understanding the characteristics and activities of 'I' and harmony in 'I' - Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail - Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available tome. Identifying from one's own life.

Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT III **9 Hrs**

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

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect asthe foundational values of relationship - Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship - Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals - Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT IV **9 Hrs**

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature - Interconnectedness and mutual fulfilment among the four orders of nature-reyclability and self-regulation in nature - Understanding Existence as Co-existence of mutually interacting units in all-pervasive space - Holistic perception of harmony at all levels of existence - Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT V **9 Hrs**

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. - Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order: ((a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, (b)At the level of society: as mutually enriching institutions and organizations - Sum up

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. To discuss the conduct as an engineer or scientist etc.

Total No. of Hrs: 45

Text Book

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

Reference Books

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Subject Code: EBCE22L01	Subject Name : SURVEYING LABORATORY	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Hill and Advanced Surveying	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To train the students with the practical knowledge on basic surveying methods for construction and road purpose

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Prepare the survey sheet according to the method used
CO2	Apply theoretical considerations in field and other engineering projects
CO3	Able to survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically
CO4	Record the reduced levels using various methods of levelling and measurement of horizontal & vertical angles by Theodolite
CO5	Setting out works for foundation marking, use of stereoscope for 3-D viewing, Co-ordinate measurements by GPS and Traversing by Total station

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22L01	Subject Name : SURVEYING LABORATORY	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Hill and Advanced Surveying	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I CHAIN SURVEYING 6 Hrs

Ranging – Chaining – Traverse

UNIT II COMPASS SURVEYING 6 Hrs

Determination of distance between two inaccessible points with compass - Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment - Correction for Local Attraction by Prismatic Compass

UNIT III PLANE TABLE SURVEYING 9 Hrs

Triangulation to find distance between inaccessible points with and without known scale – Three-Point Problem – Two-Point Problem.

UNIT IV LEVELLING 12 Hrs

Study of levels and leveling staff – Fly leveling using dumpy level – Fly leveling using tilting level – Check leveling.

UNIT V THEODOLITE 12 Hrs

Study of Theodolite Measurement of angles by reiteration and repetition – Measurement of vertical angles - Tangential system (using theodolite, leveling staff) - Stadia system (using theodolite, leveling staff) - Sub tense system (using theodolite, tape, cross staff, leveling staff)

Total No of Hrs: 45

TEXT BOOKS

1. Punmia B.C., “Surveying ", Vols. III, Laxmi Publications, Mumbai,1999 and I, II.
2. N.N Basak, “ Surveying and Levelling ", Tata McGraw – Hill Publishing Company Limited New Delhi, 2004.

REFERENCES

1. *Clark D., "Plane and Geodetic Surveying ", Vols. II and C.B.S. Publishers, I and Distributors, New Delhi, Sixth Edition, 1991.*
2. *James M. Anderson and Edward M. Mikhail, "Introduction to Surveying ", McGraw Hill Book Company, New Delhi, 1995*

Subject Code: EBCE22L02	Subject Name : STRENGTH OF MATERIALS LABORATORY	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Mechanics of Solids	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- The objective of the strength of materials lab is to demonstrate the basic principles in the area of strength and mechanics of materials and structural analysis to the undergraduate students through a series of experiments. In this lab the experiments are performed to measure the properties of the materials such as impact strength, tensile strength, compressive strength, hardness, ductility etc.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Measure tensile, shear and torsion capacity of steel rods
CO2	Understand the tensile, shear and torsional capacity of steel rods
CO3	Demonstrate and conduct experiment to find impact strength, hardness value of metal specimens, compression of springs and deflection of metal beams
CO4	Analyze the Hardness values of metals like mild steel, brass, copper and aluminum
CO5	Evaluate the deflection and impact values of metal specimens

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22L02	Subject Name : STRENGTH OF MATERIALS LABORATORY	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Mechanics of Solids	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

1. Tension test on mild steel rod
2. Compression test on wooden specimen
3. Double shear test on mild steel and aluminum rods
4. Torsion test on mild steel rod
5. Impact test on metal specimen
6. Hardness tests on metals like mild steel, brass, copper and aluminum
7. Deflection test on metal beam
8. Compression test on helical spring

Total No of Hours: 45

References:

1. Timoshenko S.P, &Young, D.H. Strength of Materials – East West Press Ltd. 3. Relevant 813 code. Venon john, Engineering Materials, 3rt Edition, McMillan Co.Ltd.,

Subject Code: EBCT22IL1	Subject Name : Water Analysis Lab	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Chemical Technology	**Lb**	**0**	**0/0**	**2/0**	**1**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research
C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab/ Internal evaluation

OBJECTIVE:

- To reduce the impurities to a certain level that does not cause harm to human health.
- To reduce the objectionable colour, odour, turbidty and hardness.
- To make water safe for drinking and usable application.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Sampling techniques and sample for the analysis at water components
CO2	Apply analytical techniques for specific test
CO3	Compare advance and conventional techniques for specific water sample
CO4	Apply a range at physical and chemical testing of the sample
CO5	Analysis interpret of report on result obtained in given formate

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	2	1
CO5	2	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓		✓			

Subject Code: EBCT22IL1	Subject Name : Water Analysis Lab	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Chemical Technology	**Lb**	**0**	**0/0**	**2/0**	**1**
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab/ Internal evaluation						

1. Alkalinity, phenolphthalein
2. Bicarbonate
3. Biochemical Oxygen Demand
4. Chemical Oxygen Demand
5. Carbonate calculation from pH & alkalinity
6. EDTA titration method for calcium analysis

Total No of Hrs: 30

Subject Code: EBCE22ET1	Subject Name : BUILDING MATERIALS	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Industrial Chemistry	ETL	1	0/0	2/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To impart knowledge on different materials and properties
- To understand the engineering aspects related to buildings

COURSE OUTCOMES (COs) : (3- 5)

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

CO1	Identify and characterize building materials
CO2	Understand the manufacturing process of bricks and cement
CO3	To have a clear understanding about foundation and its type

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	-	3	2	-	-	-	-	-
CO2	3	3	-	3	-	3	2	-	-	-	-	-
CO3	3	3	-	3	-	3	2	-	-	-	-	-

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22ET1	Subject Name : BUILDING MATERIALS	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Industrial Chemistry	ETL	1	0/0	2/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

UNIT I BRICKS, AGGREGATES AND CEMENT 9 Hrs

Bricks – Classification – Manufacturing process – Test on bricks – Aggregate: Natural Stone Aggregate – Industrial By- product – Crushing strength, impact strength, and flakiness – Abrasion resistance – Grading – sand – Bulking. Cement: Cement Ingredients – Manufacturing Process – Types – Testing of Cement

UNIT II MASONRY& MORTAR 9 Hrs

Masonry - stone masonry - rubble and Ashlar masonry - Brick masonry - Bond - Definition need and scope - Types of bonds - English and Flemish bond - merits and demerits - composite masonry - solid and hollow block masonry-soil-cement bricks-Load bearing and non-load bearing walls- Codal provisions.Mortar – Preparation of Lime and Cement Mortar- Concrete – Ingredients – Manufacturing Process – Batching Plant – Ready Mix Concrete - Paints - Plastics – Glass

UNIT III SUB STRUCTURE AND SUPER STRUCTURE 9 Hrs

Substructure – Setting Out of Foundation and Trenches – Excavation and Timbering – Foundation –Shallow Foundation – Deep Foundation. Super Structure.

UNIT IV FLOOR, ROOF & STAIR CASE 9 Hrs

Floors - Types of floor - Details of concrete and terrazzo floors - Roofs - Types of Roofs - Types of Flat roofs - sloping roofs -different types and usage - shell roofs - roof coverings-AC sheets-GI sheets-FRP roofs Water proofing treatment of roofs -tar felt treatment- chemical treatment- Types of weathering courses .Stair Case – Definition – Types of Stair – General Dimension and Requirements – Layout of Stair Case.

UNIT V BUILDING SERVICES 9 Hrs

Damp Proofing- Acoustics Treatment – Thermal Insulation – Fire Protection – Ventilation – Earth Quake Protection- Integration of services in buildings - water supply & plumbing layout for a residential building - elevators & escalators - planning & installation - basic components of the electrical system for a residence .

Total No of Hrs: 45

PRACTICE SESSIONS

Include practice sessions for Assessment of physical properties of bricks such as absorption, shape and size, structure, soundness, Hardness, presence of soluble salts, Hardness, impact and water absorption test etc for stones, different types of bonds for bricks and stones, defects in timber

TEXT BOOKS

1. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Building Construction" - Laxmi Publications (P) ltd., New Delhi.
2. Rangwala, S.C. Engineering Materials, Charotar Publishing House, 8th ed.1983. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and method of Construction, Dhanpat roy and Sons, 1997.

REFERENCES

1. *Taylor, G.D .Materials of Construction, USA Longman Inc, 1989.*
2. *Arora and Bindra, Building Materials and Building Construction, Dhanpat Raj*

IV SEMESTER

Subject Code **EBMA22008**	Subject Name **: Statistical and Numerical Methods for Mechanical and Civil Engineers**	**Ty/ Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: First year Engineering Mathematics	Ty	3	1	0	4

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

The student should be made to:

To be able to apply the concepts in Statistics
To understand the concepts in Probability
To understand the concepts in Numerical methods
To be able to solve Algebraic and Transcendental equations.
To understand the concepts in Interpolation

COURSE OUTCOMES (COs) :

CO1	To be able to analyze Statistical data
CO2	To be able to understand probability theory
CO3	To be able to understand the concepts in Numerical methods
CO4	To be able to solve algebraic and Transcendental equations
CO5	To be able to apply Interpolation concepts

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	3	1	1	1	2	2	1	3
CO2	3	3	1	3	2	2	1	1	2	1	2	2
CO3	2	3	1	2	2	3	3	1	1	2	2	3
CO4	2	3	1	1	1	3	3	1	1	2	1	2
CO5	3	2	1	3	1	2	3	1	1	2	2	2

COs / PSOs	**PSO1**	**PSO2**
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
	✓											

Subject Code **EBMA22008**	Subject Name **: Statistical and Numerical Methods for Mechanical and Civil Engineers**	**Ty/ Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: First year Engineering Mathematics	Ty	3	1	0	4
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I BASICS OF STATISTICS 12 hrs

Variables – Uni-variate Data – Frequency Distribution – Measures of Central Tendency – Mean –Median –Mode – Quartiles – Measures of Dispersion – The Range – Quartile Deviation –Standard Deviation – Relative Measures of Dispersion – Coefficient of Variation – Quartile Coefficient of Variation.

UNIT II PROBABILITY AND RANDOM VARIABLE 12 hrs

Axioms of Probability – Conditional probability – Total probability – Baye's Theorem – Random variable – Probability mass function – Probability density function – Properties – Moments (Definition and simple problems).

UNIT III BASICS OF NUMERICAL METHODS 12 hrs

Curve fitting-Method of group averages-Principle of least square-Method of moments-Finite differences-Operators (Forward, Backward & Shifting) -Relationship between the operators.

UNIT IV SOLUTION OF EQUATIONS 12 hrs

Solution of Algebraic and Transcendental equations – Method of false position – Iteration method – Newton-Raphson method – Solution of Linear system of equations – Gauss Elimination method – Gauss-Jordan method – Iterative methods – Gauss-Jacobi method – Gauss-Seidel method – Matrix Inversion by Gauss-Jordan method.

UNIT V INTERPOLATION 12 hrs

Newton forward and backward differences – Central differences – Stirling's and Bessel's formulae – Interpolation with Newton's divided differences – Lagrange's method.

Total no. of hrs: 60

Reference Books:

1. Veerarajan T., *Probability, Statistics and, Random Processes*, Tata McGraw Hill Publishing Co., (2008).
2. Singaravelu, *Probability and Random Processes*, Meenakshi Agency, (2017).
3. Gupta S.C., Kapoor V.K., *Fundamentals of Mathematical Statistics*, S.Chand & Co., (2007).
4. Veerarajan T., *Numerical Methods*, Tata McGraw Hill Publishing Co., (2005).
5. Sastry S.S., *Introductory Methods of Numerical Analysis*, Prentice Hall of India, (2003).
6. Kandasamy P., Thilagavathy, Gunavathy K., *Numerical Methods (Vol.IV)*, S.Chand & Co., (2008).

Subject Code: EBCE22004	Subject Name : STRENGTH OF MATERIALS	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Mechanics of solids	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To impart knowledge about deflection in beams by various methods
- To impart knowledge about analyzing the structural elements by energy concepts and finding stresses and deflection
- To impart knowledge about behavior of columns, critical loads and design of columns

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, Students will have

CO1	Thorough knowledge in analysis of indeterminate beams and use of energy method for estimating the slope and deflections of beams and trusses
CO2	To understand beams and failure of materials
CO3	To apply the energy principles to solve practical problems
CO4	To analyze indeterminate beams for various loading conditions
CO5	To assess the behavior of columns

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22004	Subject Name : STRENGTH OF MATERIALS	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Mechanics of solids	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I BENDING OF BEAMS 10 Hrs

Bending of Beams of Symmetrical and Unsymmetrical Sections – Box sections and its importance — Winkler Bach Formula - Shear Center Simple problems

UNIT II ENERGY PRINCIPLES 11 Hrs

Strain energy and strain energy density - Strain energy in tension, shear, flexure and torsion - Castigliano's & Engessor's energy theorems- Principle of Virtual Work- Application of energy theorems for computing deflection in Determinate structures – Maxwell's reciprocal theorem.

UNIT II DEFLECTIONS 13 Hrs

Methods of Deflection Determination of Deflection curve – computation of slopes and deflections in Determinate Beams - Double Integration method – Macaulay's method – Area Moment method –Conjugate Beam method.

UNIT IV INDETERMINATE BEAMS 13 Hrs

Propped Cantilever and Fixed Beams - Fixed End Moments and Reactions for Standard cases of Loading - Continuous Beams - Theorem of Three Moments - Analysis of Continuous Beams - S.F. and B.M. Diagrams for Continuous Beams.

UNIT V COLUMNS 13 Hrs

Eccentrically Loaded Short Columns Middle Third Rule - Core of Section - Columns of Unsymmetrical Sections - Rankine – Gordon Formula Eccentrically Loaded Long Columns. Theories of Failure - Principal Stress, Principal Strain, Shear Stress, Strain Energy and Distortion Energy Theories.

Total No of Hrs: 60

TEXT BOOKS

1. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007.
2. Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010.
3. R.S. Khurmi, "Engineering Mechanics of Solids ", Prentice Hall of India, New Delhi, 1997.
4. S.S Ratan, "Strength of Materials ", Tata McGraw Hill Publishing Company, New Delhi, 2008

REFERENCES

1. *Laudner T.J. and Archer R.R., " Mechanical of Solids in Introduction ",McGraw Hill International Editions, New Delhi,1994..*
2. *William A.Nash, " Theory and Problems of Strength of Material" Schaum's outline series, Mc Graw Hill International Editions, New Delhi, 1994*

Subject Code: EBCE22005	Subject Name : FLUID MECHANICS AND HYDRAULIC ENGINEERING	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To know the importance, application and inter-relationship of various properties of fluid.
- To study theories those explain the behavior and performance of fluid when the fluid is flowing through the pipe.
- To understand the utilization of dimensional analysis as a tool in solving problems in the field of fluid mechanics.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To learn about the basics of fluid mechanics and various properties of fluids
CO2	To understand various forces on plane and curved surfaces and the concepts of buoyancy
C03	To apply the principles of fluid kinematics and dynamics
C04	To analyze boundary layer flow and flow through pipes
C05	To evaluate various models like distorted models and various dimensionless numbers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	1	1	1	1	1	3
CO2	3	3	3	3	2	3	1	1	1	1	1	3
C03	3	3	3	3	2	3	1	1	1	1	1	3
C04	3	3	3	3	2	3	1	1	1	1	1	3
C05	3	3	3	3	2	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
C03	3	3
C04	3	3
C05	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22005	Subject Name : FLUID MECHANICS AND HYDRAULIC ENGINEERING	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I FLUID STATICS AND PROPERTIES 12 Hrs

Definitions - Fluid and Fluid Mechanics - Dimensions and Units - Fluid properties –Viscosity, Compressibility, Surface tension and Capillarity, Continuum - concept of system and control volume- Pascal's law and Hydrostatic equation - buoyancy -meta centric height – pressure measurement – gauges and manometers.

UNIT II FLUID KINEMATICS AND DYNAMICS 12 Hrs

Stream, streak and path lines - classification of flows - continuity equation - stream and potential functions –flow nets – velocity and acceleration measurement-Problems- Euler and Bernoulli's equations - application of Bernoulli's equation - discharge measurement -Hagen Poiseuille equation .

UNIT III FLOW THROUGH PIPES AND DIMENSIONAL ANALYSIS 12 Hrs

Darcy Weisbach formula -Major and minor losses of flow in pipes – pipes in series and in parallel – Dimensional analysis - Buckingham π -theorem.

UNIT IV UNIFORM AND RAPIDLY VARIED FLOW 12 Hrs

Open channel flow - types and regime of flow - velocity distribution in open channel - specific energy - critical flow and its computation - Uniform flow - velocity measurement - manning's and Chezy's formula - determination of roughness coefficients - most economical sections- Rectangular, Circular and Trapezoidal channel sections .Hydraulic jump - types - energy dissipation – surges

UNIT V PUMPS AND TURBINES 12 Hrs

Introduction – classification – Rotodynamic pumps: centrifugal pumps – work done – losses – spe12ific speed - minimum speed to start the pump- multistage pumps- parallel and series- reciprocating pump –work done- slip - Pelton wheel turbine –work done-Francis turbine –work done- Kaplan turbine –work done.

Total No of Hrs: 60

TEXT BOOKS

1. Dr.R. K. Bansal., "Fluid Mechanics and Hydraulic Machines ", Laxmi Publications 2015.
2. Fox, Robert W. And McDonald, Alan T., "Introduction to Fluid Mechanics ",John Willey & sons

REFERENCES

1. *Streeter, Victor l. And Wylie, Benjamin E., "Fluid Mechanics ", McGraw-Hill Ltd., 1998.*
2. *Natarajan M.K., "Principles of Fluids Mechanics ", Anuradha Agencies, Kumbakonam, 1995*

Subject Code: EBEC22ID5	Subject Name: APPLICATIONS OF IoT IN CIVIL ENGINEERING	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the fundamentals about IoT
- To study about IoT Access technologies
- To study the design methodology and different IoT hardware platforms
- To study the basics of IoT Data Analytics and supporting services
- To study about various IoT case studies and industrial applications

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student shall have a knowledge on fundamentals about IoT
CO2	Understand about IoT Access Technologies
CO3	Apply the concept of IoT for Civil Engineering purposes
CO4	Analyze various data for effective data management strategies
CO5	Evaluate the need for effective management in construction domain and use IoT appropriately

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	1	1	3	1	3	3
CO2	3	3	3	3	3	3	1	1	3	1	3	3
CO3	3	3	3	3	3	3	1	1	3	1	3	3
CO4	3	3	3	3	3	3	1	1	3	1	3	3
CO5	3	3	3	3	3	3	1	1	3	1	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓					

Subject Code: EBEC22ID5	Subject Name APPLICATIONS OF IoT IN CIVIL ENGINEERING	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	2
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I IOT AND CONSTRUCTION 9 Hrs

Fundamentals in IoT, - Sensors, wearbles, real time maps, applications in safety, resource management and budgeting

UNIT II IOT IN WASTE MANAGEMENT 9 Hrs

Route optimization- Smart recycling- Data analysis- The Future of Waste Management - Smart Waste Management Platform - Benefits of Smart Waste Management

UNIT III REMOTE MANAGEMENT TRENDS 9 Hrs

The Rise of Remote Management in Construction - Remote Management Tips For Construction Project Managers – future of construction management with remote technology (Need and technologies)

UNIT IV SAFETY MANAGEMENT IN CONSTRUCTION 9 Hrs

On-site AI – chatbot - IoT applications - Sensors and RFID - Enhance Safety through IoT integration - IoT-based application for construction site safety monitoring

UNIT V DATA MANAGEMENT FOR CONSTRUCTION INDUSTRY 9 Hrs

Advantages of good construction data management - Importance of Database Management in the Construction Industry – Building Information Modelling

Total No of Hrs: 45

Text books:

1. Biswaranjan Acharya, Satarupa Dey, Mohammed Zidan, IoT-Based Smart Waste Management for Environmental Sustainability, CRC Press
2. Peter Waher, Learning Internet of Things, Packt Publishing
3. Gren Gale, The Remote Project Manager
4. Rita Yi Man Li, Construction Safety Informatics, Springer Singapore
5. Dr. Adv. Harshul Savla, Dr. Chandrahauns Chavan, Ar. Pallavi Patil, Building Information Modeling: Global & Indian Perspective, Notion Press; 1st edition

Subject Code: EBCC22I04	Subject Name : The Indian Constitution	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	IE	2	0/0	0/0	0

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To provide an overview of the history of the making of Indian Constitution
- To understand the preamble and the basic structures of the Constitution.
- To Know the fundamental rights, duties and the directive principles of state policy
- To understand the functionality of the legislature , the executive and the judiciary

COURSE OUTCOMES (COs) : After studying this course the student would be able to

CO1	To provide an overview of the history of the making of Indian Constitution
CO2	To understand the preamble and the basic structures of the Constitution.
CO3	To Know the fundamental rights, duties and the directive principles of state policy

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	1	1	1	1	-	-
CO2	-	-	-	-	-	3	1	1	1	1	-	-
CO2	-	-	-	-	-	3	1	1	2	1	-	-

COs / PSOs	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓					

Subject Code: EBCC22I04	Subject Name : The Indian Constitution	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	IE	2	0/0	0/0	0
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT 1 **6 Hrs**

The History of the Making of Indian Constitution, Preamble and the Basic Structures

UNIT 2 **6 Hrs**

Fundamental Rights and Duties, Directive Principles of State Policy

UNIT 3 **6 Hrs**

Legislature, Executive and Judiciary

UNIT 4 **6 Hrs**

Emergency Powers

UNIT 5 **6 Hrs**

Special Provisions for Jammu and Kashmir, Nagaland and Other Regions, Amendments

Total no Hrs: 30

TEXT BOOKS:

1. D D Basu, Introduction to the Constitution of India, 20th Edn.,LexisnexisButterworths, 2012.

REFERENCE BOOKS:

1. *Rajeev Bhargava (ed), Ethics and Politics of the Indian Constitution, Oxford University Press, New Delhi, 2008.*
2. *Granville Austin, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, Oxford, 1966.*
3. *Zoya Hassan, E. Sridharan and R. Sudarshan (eds), India's Living Constitution: Ideas, Practices, Controversies, Permanent Black, New Delhi, 2002.*
4. *Subhash C. Kashyap, Our Constitution, National Book Trust, New Delhi, 2011.*

Subject Code: EBCC22I05	Subject Name : The Indian traditional knowledge	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	IE	2	0/0	0/0	0

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System
- To understand the Traditional Medicine, Traditional Production and Construction Technology
- To Know the History of Physics and Chemistry, Traditional Art and Architecture and Vastu Shashtra, Astronomy and Astrology
- To understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

COURSE OUTCOMES (COs) : After studying this course the student would be able to

CO1	To understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System
CO2	To understand the Traditional Medicine, Traditional Production and Construction Technology
CO3	To understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	3	1	-	2	-	-	-	2	-	1
CO2	-	3	3	1	-	2	-	-	-	2	-	1
CO2	-	3	3	1	-	2	-	-	-	2	-	1

COs / PSOs	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓					

Subject Code: EBCC22I05	Subject Name : The Indian traditional knowledge	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	IE	2	0/0	0/0	0
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I **6 Hrs**

Historical Background: TKS During the Pre- colonial and Colonial Period, Indian Traditional Knowledge System

UNIT II **6 Hrs**

Traditional Medicine, Traditional Production and Construction Technology

UNIT III **6 Hrs**

History of Physics and Chemistry, Traditional Art and Architecture and Vastu Shashtra, Astronomy and Astrology

UNIT IV **6 Hrs**

Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

UNIT V **6 Hrs**

TKS and the Contemporary World, TKS and the Indian Union, TKS and IT Revolution

Total no Hrs: 30

TEXT BOOKS:

1. Amit Jha (2009) , Traditional knowledge system in india, 1st Edition, Delhi University (North Campus)
2. Dr.A.K.Ghosh (2011), Traditional Knowledge of Household Products

Subject Code: EBMA22IL1	Subject Name : MATHEMATICAL SOFTWARE FOR CIVIL ENGINEERS	Ty/ Lb/ ETL/I	L	T / S.Lr	P/ R	C
	Prerequisite: Mathematics III	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To know about fundamentals of MATLAB and SPSS tools
- To provide an overview to program curve fitting & solve Linear and Nonlinear Equations
- To understand the concept and importance of Fourier transforms
- To gain knowledge to solve Civil Engineering problems

COURSE OUTCOMES (COs) : After studying this course the student would be able to

CO1	Able to know the fundamentals of MATLAB and SPSS tools
CO2	Able to program curve fitting, numerical differentiation and integration, solution of linear equations in MATLAB and SPSS to solve Civil Engineering problems
CO3	Able to implement loops, branching, control instruction and functions in MATLAB and SPSS programming environment
CO4	Ability to perform analysis of experimental data with variables and compare the analytical data with experimental data
CO5	Ability to evaluate the relationship between variables and fit a line for various experimental and research purposes

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	1	1	1	1	1	1	3
CO2	3	3	3	3	3	1	1	1	1	1	1	3
CO3	3	3	3	3	3	1	1	1	1	1	1	3
CO4	3	3	3	3	3	1	1	1	1	1	1	3
CO5	3	3	3	3	3	1	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓		✓			

Subject Code: EBMA22IL1	Subject Name : MATHEMATICAL SOFTWARE FOR CIVIL ENGINEERS	Ty/ Lb/ ETL/I	L	T / S.Lr	P/ R	C
	Prerequisite: Mathematics III	Lb	0	0/0	2/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION TO SPSS **6 Hrs**

SPSS Environment: data editor, output viewer, syntax editor – Data view window – SPSS Syntax – Data creation – Importing data – Variable types in SPSS and Defining variables – Creating a Codebook in SPSS.

UNIT II DIAGRAMMATIC REPRESENTATION **6 Hrs**

Simple Bar diagram – Multiple bar diagram – Sub-divided Bar diagram - Percentage diagram - Pie Diagram – Frequency Table – Histogram – Scatter diagram – Box plot

UNIT III MEASURES OF CENTRAL TENDENCY AND DISPERSION **6 Hrs**

Measures of Central Tendency – Mean –Median –Mode – Quartiles – Measures of Dispersion – The Range – Mean deviation -Quartile Deviation –Standard Deviation – Relative Measures of Dispersion – Coefficient of Variation – Quartile Coefficient of Variation

UNIT IV CORRELATION AND REGRESSION **6 Hrs**

Bi-variate data – Applications of Correlation: Karl Pearson's Coefficient of Correlation – Rank Correlation: Spearman's Rank Correlation – Linear Regression.

UNIT V APPLICATIONS **6 Hrs**

Applications of SPSS in Civil Engineering

Total no Hrs: 30

REFERENCES

1. Gupta S.C., Kapoor V.K., *Fundamentals of Mathematical Statistics*, S.Chand & Co., (2007).
2. Veerarajan T., *Probability, Statistics and, Random Processes*, Tata McGraw Hill Publishing Co., (2008).
3. Sabaine Landau and Barin.S Everitt, A Handbook of Statistical Analysis Using SPSS, Chapman& Hall/ CRC., (2003)
4. SPSS for Intermediate Statistics: Use and Interpretation, Nancy L. Leech et. al., Second edition published in 2005 by Lawrence Erlbaum Associates, Inc.
5. HOW TO USE SPSS ® A Step-By-Step Guide to Analysis and Interpretation, Brian C. Cronk, Tenth edition published in 2018 by Routledge.

Subject Code: EBCE22L03	Subject Name : FLUID MECHANICS & HYDRAULIC MACHINERY LABORATORY	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Fluid Mechanics and Hydraulic Engineering	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn the aim, working principle, components and function of hydraulic equipments.
- To get hand-on experience in the operation of hydraulic machines.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Measure theoretical discharge in pipes, Venturimeter, orificemeter and notches
CO2	Understand the working principle of orificemeter, venturimeter, pumps and turbines
CO3	Demonstrate and conduct experiment to find characteristic curves of various pumps and turbines
CO4	Compare characteristic curves of various pumps and turbines
CO5	Evaluate the major and minor energy losses in pipes

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22L03	Subject Name : FLUID MECHANICS & HYDRAULIC MACHINERY LABORATORY	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Fluid Mechanics and Hydraulic Engineering	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I FLOW MEASUREMENT 12 Hrs

i. Venturimeter.
ii. Orifice meter.

UNIT II LOSSES IN PIPES 9 Hrs

Estimation of major energy and minor losses in pipes

UNIT III PUMPS 12 Hrs

Performance characteristics of
i. Rated speed centrifugal pump.
ii. Gear pump.
iii. Reciprocating pump**.**

UNIT IV TURBINES 12 Hrs

Performance characteristics of Pelton wheel turbine and Francis turbine.

Total No of Hrs: 45

TEXT BOOKS

1. Dr. R. K.Bansal., "Fluid Mechanics And Hydraulic Machines ", Lakshmi Publications (P) Ltd.New Delhi 2005.
2. Fox, Robert w. and Mcdonald, Alan T., "Introduction to Fluid Mechanics ",John Willey & Sons, New Jersey

REFERENCES

1. *Streeter, Victor L. And Wylie, Benjamin e., "Fluid Mechanics ", McGraw-Hill Ltd.New Delhi, 1998.*
2. *Natarajan M.K., "Principles of Fluids Mechanics ", Anuradha agencies, Vidayal karuppur, kumbakonam, 1995*

Subject Code: EBCE22L04	Subject Name : AUTOCADD laboratory	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To provide the student with an appreciation of the capabilities and limitations of the AutoCAD program.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Draw plan, section and elevation for various structures
CO2	Understand geometric construction and basic commands in Autocad
CO3	Prepare the building plans satisfying the principles of planning and byelaws.
CO4	Prepare detailed working drawings of doors, windows, roof trusses and staircases
CO5	Ability to manipulate drawings through editing and plotting techniques

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22L04	Subject Name : AUTOCADD laboratory	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

EXPERIMENTS

1. Learn and use basic AutoCAD commands - manage drawing using layers, colour and line types - complete basic cad drawings, with borders, text and dimensions - use and edit text and text styles – Method of scales in various drawing - understand and the use of blocks.
2. Development of line plan for residential building. one for single storied building
3. Development of line plan for residential building. one for two storied building
4. Submission drawing for residential building including its planning and with area and parking statements and all other details as per the norms and local bye-laws.
5. Industrial buildings with roof truss.
6. To draw the 3D view of residential building.

Total No of Hrs: 45

TEXT BOOKS

1. Civil Engg. Drawing & House planning – B.P.Verma, Khanna publishers, Delhi,1990
2. Building drawing & detailing – Dr. Balagopal & T.S.Prabhu, Spades publishers, Calicut,1989.

REFERENCES

1. *Building drawing – Shah, Tata McGraw-Hill, New Delhi,2000.*
2. *Building planning & drawing – Dr. N.Kumaraswamy, A.Kameswara Rao, Charotar publishing house. Mumbai,1997.*
3. *Shah, Kale and Patki, Building drawing, Tata McGraw-Hill New Delhi,,1998.*

Subject Code:	Subject Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY	Ty/ Lb/ ETL/IE	L	T/ S.Lr	P/ R	C
EBCS22IL4	**Prerequisite:** Artificial Intelligence And Machine Learning	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Study the concepts of Artificial Intelligence.
- Learn the methods of solving problems using Artificial Intelligence.
- Introduce the concepts of Expert Systems and machine learning

COURSE OUTCOMES (COs) : Students will able to:

CO1	Write a R program to merge two given lists into one list, given matrix into one list.
CO2	Demonstrate the working of the decision tree based ID3 algorithm
CO3	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file.
CO4	Apply EM algorithm to cluster a set of data stored in a .CSV file
CO5	Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set using Java/Python ML library.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
							✓		✓			

Subject Code:	Subject Name : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY	Ty/ Lb/ ETL/IE	L	T/ S.Lr	P/ R	C
EBCS22IL4	**Prerequisite:** Artificial Intelligence And Machine Learning	Lb	0	0/0	2/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab						

1. Write a R program to list containing a vector, a matrix and a list and give names to the elements in the list.
2. Write a R program to merge two given lists into one list.
3. Write a R program to convert a given matrix to a list.
4. Write a program to demonstrate the working of the decision tree based ID3 algorithm.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file.
6. Apply EM algorithm to cluster a set of data stored in a .CSV file.
7. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set.

Total No. of Hrs: 30

Subject Code: EBCE22I01	Subject Name : TECHNICAL SKILL I - MANUAL BUILDING DRAWING	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic Engineering Graphics	IE	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Acquire knowledge on plan, elevation and section of buildings
CO2	Understand the Principles of site selection, orientation of buildings and distribution of space
CO3	Apply the concept of drafting a plan practically while constructing a structure
CO4	Analyze the dimensions of openings in various types of buildings and draft a plan accordingly
CO5	Develop a detailed plan from line sketch

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓				✓				

Subject Code: EBCE22I01	Subject Name : TECHNICAL SKILL I - MANUAL BUILDING DRAWING	Ty/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic Engineering Graphics	IE	0	0/0	2/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

Students should acquire skill in the domain/inter disciplinary area from government/private training centers/industries /University for a minimum period of 15 calendar days. The training can be through off line, online or mixed mode. Students are supposed to prepare Technical skill report at the end of the training and submit the report along with the certificate in proof of the training, during the viva voce examination conducted by the examiners duly appointed by the head of the department.

Experiments

1. Basic concept, purpose, function and types of building (Residential, Industrial and Institutional)
2. Principles of site selection, orientation of buildings and distribution of space.
3. Line plan. Development of plan from a line plan.
4. Details of Doors, windows, foundation and stair case etc.
5. Single storied residential building with flat and tiled roof.
6. Public buildings like office, dispensary, post office, bank etc.
7. Factory building with trusses supported on Brick walls and pillars.

Total No of Hrs: 30

TEXT BOOKS

1. Civil Engg. Drawing & House planning – B.P.Verma, Khanna publishers, Delhi,1990
2. Building drawing & detailing – Dr. Balagopal & T.S.Prabhu, Spades publishers, Calicut,1989.

REFERENCES

1. *Building drawing – Shah, Tata McGraw-Hill, New Delhi,2000.*
2. *Building planning & drawing – Dr. N.Kumaraswamy, A.Kameswara Rao, Charotar publishing house. Mumbai, 1997.*
3. *Shah, Kale and Patki, Building drawing, Tata McGraw-Hill New Delhi,,1998.*
4. *Balagopal T.S. Prabhu, Building drawing and detailing, Spades Publishers*
5. *Shah & Kale, Building Drawing, Tata McGraw Hill*
6. *B.P. Verma, Civil Engineering Drawing and housing Planning, Khanna Publishers*

Subject Code: EBCC22I06	Subject Name : SOFT SKILL - I EMPLOYABILITY SKILLS	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Technical English, Communicative English Lab	IE	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To create awareness in students, various top companies helping them improve their skill set matrix, leading to develop a positive frame of mind.
- To help students be aware of various techniques of candidate recruitment and help them prepare CV's and resume.
- To help student how to face various types of interview, preparing for HR, technical interviews.
- To help students improve their verbal reading, narration and presentation skills by performs various mock sessions.

COURSE OUTCOMES (COs) : (3- 5) Students will be able to

CO1	Be aware of various top companies leading to improvement in skills amongst them.
CO2	Be aware of various candidate recruitment techniques like group discussion, interviews and be able to prepare CV's and resumes.
CO3	Prepare for different types of interviews and be prepared for HR and technical interviews.
CO4	Improve their verbal, written and other skills by performing mock sessions.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	2	2	3	2	3	2	3
CO2	1	1	1	1	1	2	2	3	2	3	2	3
CO3	1	1	1	1	1	2	2	3	2	3	2	3
CO4	1	1	1	1	1	2	2	3	2	3	2	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
			✓					✓				

Subject Code: EBCC22I06	Subject Name : SOFT SKILL - I EMPLOYABILITY SKILLS	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Technical English, Communicative English Lab	IE	0	0/0	2/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I **6 Hrs**

Creation of awareness of top companies / improving skill set matrix / Development of positive frame of mind / Creation of self-awareness.

UNIT II **6 Hrs**

Group discussions / Do's and don'ts – handling group discussions / what evaluators look for interpersonal relationships / Preparation of Curriculum Vitae / Resume.

UNIT III **6 Hrs**

Interview – awareness of facing questions – Do's and don'ts of personal interview / group interview, enabling students to prepare for different proce3dures such as HR interviews and Technical Interviews / self-introductions.

UNIT IV **6 Hrs**

Verbal aptitude, Reading comprehension / narration / presentation / Mock Interviews.

UNIT V **6 Hrs**

PRACTICAL SESSION

Practical session on Group Discussion and written tests on vocabulary and reading comprehension

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total No of Hrs: 30

V SEMESTER

Subject Code: EBCE22006	Subject Name : ENVIRONMENTAL ENGINEERING	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Chemistry and Industrial Chemistry	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

- **OBJECTIVE** :
- To impart knowledge in fundamental theory and design of conventional water treatment facilities.
- To impart knowledge in fundamental theory and design of conventional wastewater treatment facilities.
- To impart knowledge on the principles used to design advanced wastewater treatments.
- To develop the ability to solve a specific problem right from its identification till the successful solution of the same

COURSE OUTCOMES (COs) : (3- 5)

CO1	Impart knowledge in fundamental theory and design of conventional water and wastewater treatment facilities
CO2	Understand drinking water supply and waste water systems, including water transport, treatment and distribution and the ability to design and evaluate water supply and waste water project alternatives
CO3	Applying water quality and waste water criteria and standards, and their relation to public health
CO4	Analyze challenging practical problems and find solution by formulating proper methodology
CO5	Evaluate the methods of sewage disposal and formulate effective waste management strategies

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	3	3	3	2	2	2	2
CO2	3	3	2	3	3	3	3	3	2	2	2	2
CO3	3	3	2	3	3	3	3	3	2	2	2	2
CO4	3	3	2	3	3	3	3	3	2	2	2	2
CO5	3	3	2	3	3	3	3	3	2	2	2	2

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22006	Subject Name : ENVIRONMENTAL ENGINEERING	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Chemistry and Industrial Chemistry	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I PLANNING FOR WATER SUPPLY SYSTEMS 12 Hrs

Scope of environmental engineering – role of environmental engineer – Public water supply systems – objectives – design period – population forecasting – water demand – sources of water – sources selection – water quality – characterization – sources of wastewater –estimation of storm runoff.

UNIT II WATER TREATMENT 12 Hrs

Screening - types of screening - plain sedimentation – sedimentation with coagulation – settling & flotation - filtration - disinfection

UNIT III SEWAGE TREATMENT – PRIMARY TREATMENT 12 Hrs

Objectives – unit operations & processes – principles, functions and design of screen, grit chambers and primary sedimentation tanks.

UNIT IV : SEWAGE TREATMENT – SECONDARY TREATMENT 12 Hrs

Secondary treatment – activated sludge process and trickling filter; other treatment methods – stabilization ponds and septic tanks – advances in sewage treatment.

UNIT V: SEWAGE DISPOSAL AND SLUDGE MANAGEMENT 12 Hrs

Methods – dilution – self purification of surface water bodies – oxygen sag curve – land disposal – sewage farming – deep well injection – soil dispersion system. Thickening – sludge digestion – biogas recovery - drying beds – conditioning and dewatering – sludge disposal.

Total No of Hrs: 60

TEXT BOOKS

1. Garg, S.K., Environmental Engineering, Vols. I &II, Khanna Publishers, New Delhi, 1994
2. C.S.Shah, Water Supply And Sanitation, Galgotia Publishing Company, New Delhi, 1994

REFERENCES

1. *Manual on Water Supply And Treatment, Ministry Of Urban Development, Government Of India, New Delhi, 1999.*
2. *Manual on sewerage and sewage treatment, CPHEEO, Ministry Of Urban Development, Government Of India, New Delhi, 1993.*
3. *H.S.Peavy, D.R.Rowe and George Tchobanoglous, Environmental Engineering, Mcgraw-Hill Book Company, New Delhi, 1995.*

Subject Code: EBCE22007	Subject Name : SOIL MECHANICS	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Geology	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Provide the description and classification of soil and analysis of stresses in soils under different loading conditions ; To develop an understanding of the principles of effective stress in saturated soils, and its application to one dimensional compression and consolidation

COURSE OUTCOMES (COs) : (3- 5)

CO1	Provide the description and classification of soil and Analysis of stresses in soils under different loading conditions.
CO2	To understand the principles of effective stress in saturated soils and its application to one dimensional compression and consolidation
CO3	To apply the concept of shear strength of soil and slope stability for practical applications
CO4	To analyze the slopes using method of slices and friction circle method
CO5	To evaluate stress distribution in soil media using influence charts

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22007	Subject Name : SOIL MECHANICS	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Geology	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I : INTRODUCTION **12 Hrs**

Nature of soil - phase relationships - soil description and classification for engineering purposes - IS classification system - soil compaction - theory, comparison of laboratory and field compaction methods – factors influencing compaction.

UNIT II : SOILWATER AND WATER FLOW **12 Hrs**

Soil water - static pressure in water – capillary stresses- permeability measurement in the laboratory and field - factors influencing permeability of soil - seepage –introduction to flow nets - simple problems.

UNIT III: STRESS DISTRIBUTIONS AND SETTLEMENT **12 Hrs**

Effective stress concepts in solids - stress distribution in soil media - use of influence charts - components of settlement – factors influencing settlement of soil -immediate and consolidation settlement - Tergazhi's one-dimensional consolidation theory – computation of rate of settlement

UNIT IV: SHEAR STRENGTH **12 Hrs**

Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory - saturated soil mass – measurement of shear strength, direct shear - triaxial compression, UU, CU and CD Test.

UNIT V : SLOPE STABILITY **12 Hrs**

Slope failure mechanisms - types - infinite slopes - finite slopes - total stress analysis for saturated clay –method of slices - friction circle method - use of stability number .

Total No of Hrs: 60

TEXT BOOKS

- V.N.S. Moorthy, “soil mechanics and foundation engineering ", ubs publications and Distribution ltd, New Delhi, 1999.
- Gopal Ranjan and Rao A.S.R., “Basic and Applied Soil Mechanics ", Wiley eastern ltd., New Delhi (india), 1997.
- Arora K.R., “soil mechanics and foundation engineering ", standard publishers And distributors, New Delhi, 1997.

REFERENCES

- Holtz R.D. And kovacs W.D., “Introduction to geotechnical engineering ", Prentice-hall, New Delhi, 1995.
- Mccarthy D.F., “Essentials of soil mechanics and foundations ", Prentice-Hall, New Delhi, 97.
- Sutten B.H.C., “Solving problems in soil mechanics", Longman group scientific And technical, U.K. England, 1994
- Dass, B.M, “Principles of geotechnical engineering”, Thompson books

Subject Code: EBCE22008	Subject Name : CONCRETE TECHNOLOGY	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Building materials	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand various construction procedures from sub structure to super structure and also the equipment needed for construction of various types of structures from foundation to super structure
- To develop the ability to solve a specific problem right from its identification till the successful solution of the same

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Understand about concrete making materials , supplementary cementations materials and design the concrete mix for the required strength
CO2	Will acquire knowledge on handling of different types of construction equipments
CO3	To take up challenging practical problems and find solution by formulating proper methodology

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	2	-	-	-	-	2	-
CO2	3	3	3	-	-	2	-	-	-	-	2	-
CO3	3	3	2	-	-	2	-	-	-	-	2	-

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22008	Subject Name : CONCRETE TECHNOLOGY	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Building materials	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I CONCRETE MAKING MATERIALS 8 Hrs

Manufacture and Components of Portland Cement- Hydration Process- Types of Cement, Aggregates - Classification and Properties Admixtures.

UNIT II MIX DESIGN 10 Hrs

Properties of Fresh Concrete- Workability, Segregation and Bleeding of Concrete - Factors influencing Mix Proportions - I.S and ACI Methods of Mix Design.

UNIT III PROPERTIES OF HARDENED CONCRETE 8 Hrs

Strength - Creep and Shrinkage - Durability of Concrete - Chemical Attack - Different Types of FRC - Properties and Applications.

UNIT IV SUB STRUCTURE CONSTRUCTION 9 Hrs

Piling techniques – Sheet piles – Under water construction of Diaphragm wall and basement – Driving diaphragm walls – Driving well and caisson – Sinking coffer dam – Shoring for deep cutting – Well points – Dewatering and stand by plant equipment for underground open excavation

.

UNIT V SUPER STRUCTURE AND CONSTRUCTION EQUIPMENTS 10 Hrs

Construction sequences in cooling Towers, Bunkers, Silos and Chimney – Pre- stressed construction – In situ pre-stressing in high rise structures – Erecting light weight components on tall structures. Types of earth work equipment's - Tractors, Motor graders, Scrappers - Equipment for compaction – Batching and mixing and concreting.

Total No of Hrs: 45

TEXT BOOKS

1. Shetty. M.S., Concrete Technology, S.Chand and Co, Pune,1984
2. Arora S.P. And Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Roy and Sons, New Delhi, 1997.
3. Peurifoy, R.L., Ledbetter, W.D And Schexnayder, C., 'Consruction Plaaning, Equipment and Methods' V Edition McGraw Hill, Singapore, 1995

REFERENCES

1. *Krishnasamy. K.T., Concrete Technology, Dhanapt Rai - New Delhi – 1985*
2. *Neville, properties of concrete elbs, 1977.*
3. *Sharma S.C., Building Construction, Khanna Publishers, New Delhi.1998*

Subject Code: EBOL22I01	Subject Name : **Online Course (NPTEL/SWAYAM/Any Online MOOC APPROVED BY AICTE/UGC)**	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	IE	1	0/0	1/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

Students should register for the online course with minimum course duration of 4 weeks through the online portals such as NPTEL/SWAYAM/Any MOOC in the beginning of the semester. A mentor will be assigned by the department for monitoring the students. Students are expected to attend the online classes regularly and submit the weekly assignments before the due dates. Students should appear for the online examination and submit the certificate at the end of the semester .Internal Examination will be conducted by the examiners duly appointed by the head of the department.

Subject Code: EBCE22L05	Subject Name : ENVIRONMENTAL ENGINEERING LABORATORY	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Environmental Engineering	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To impart knowledge on preparation of reagents, testing various water and waste water quality parameters .

COURSE OUTCOMES (COs) : (3- 5)

CO1	To get hand-on experience in the operation of equipments like pH meter, TDS meter, turbidity meter, etc.
CO2	To analyze water and wastewater volumetrically and using certain equipments
CO3	The students completing the course will be able to characterize wastewater and conduct treatability studies.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	3	-	3	3	2	-	2	-
CO2	3	2	2	-	3	-	3	3	2	-	2	-
CO3	3	2	2	-	3	-	3	3	2	-	2	-

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22L05	Subject Name : ENVIRONMENTAL ENGINEERING LABORATORY	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Environmental Engineering	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

LIST OF EXPERIMENTS

1. a) Determination of pH.
   b) Determination of Turbidity.
2. Determination of Hardness.
3. Determination of Alkalinity.
4. Determination of Residual Chlorine.
5. Estimation of Chlorides.
6. Estimation of Ammonia Nitrogen.
7. Estimation of Sulphate.
8. Determination of optimum coagulant dose.
9. Determination of specific conductivity.
10. Estimation of available chlorine in Bleaching Powder.
11. Determination of dissolved Oxygen.
12. Determination of suspended settleable, volatile and fixed solids
13. B.O.D. Test.
14. C.O.D. Test.

Total No of Hrs: 45

REFERENCE BOOKS

1. *Trivedi and Goel – Chemical and biological methods for water pollution studies. New Delhi,2000.*
2. *A course Manual – Water and wastewater analysis, National Environmental Engineering Research Institute, Nagpur – publication.*
3. *Standard Methods for Examination of water and Waste water APHa, AWWA and WPCF, 1985 Edition.*

Subject Code: EBCE22L06	Subject Name : SOIL MECHANICS LABORATORY	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Soil Mechanics	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To illustrate some of the principles taught during the soil mechanics course.
- To impart knowledge of laboratory and index testing methods commonly used in Soil & foundation engineering.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Knowledge to determine Index properties of the soils like water content, specific gravity and Atterberg limits
CO2	Understand Engineering properties like field density, shear strength, permeability, compaction and consolidation
CO3	Calculate shear, UCC, consolidation and triaxial compressive strength value of soil sample
CO4	Test the soil to assess its ability to withstand the load
CO5	Determine the permeability and coefficient of consolidation values

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22L06	Subject Name : SOIL MECHANICS LABORATORY	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Soil Mechanics	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

LIST OF EXPERIMENTS

1. Specific gravity of soil solids
2. Grain size distribution - Sieve analysis - Hydrometer analysis
3. Atterberg limits test – Liquid limit, Plastic limit and shrinkage limit tests
4. Field density Test
5. Determination of moisture - Density relationship using standard proctor.
6. Permeability determination (constant head and falling head methods)
7. Direct shear test on cohesion less soil
8. Unconfined compression test in cohesive soil
9. Tri axial compression test in cohesion less soil
10. Laboratory Vane shear test in cohesive soil
11. One dimensional Consolidation test (Determination of coefficient of consolidation only)

Total No of Hrs: 45

REFERENCES

1. *"Soil Engineering Laboratory Instruction Manual ", Published by the Engineering College Co-operative Society, Chennai, 1996.*
2. *Lambe T.W., "Soil Testing for Engineers ", John Wiley and Sons, New York, 1990.*
3. *"I.S.Code of Practice (2720) Relevant Parts ", as amended from time to time.*

Subject Code: EBCE22I02	Subject Name : TECHNICAL SKILL II - SURVEY CAMP	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Surveying laboratory	IE	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- The student will go to the outside site so that they will realize the practical difficulties in taking surveys in field

COURSE OUTCOMES (COs) : (3- 5) The student will be able to

CO1	Knowledge on triangulation, trilateration, star observation and rectangulaiton
CO2	Understand the usage of Theodolite, cross staff, leveling staff, tapes and Plane table
CO3	Prepare contour map for the given area
CO4	Conduct LS and CS by using advanced equipment
CO5	Survey the given area to report on the feasibility of constructing highway, hydraulic and other Civil structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	3	3	2	3	2	2	2
CO2	3	3	2	2	3	3	3	2	3	2	2	2
CO3	3	3	2	2	3	3	3	2	3	2	2	2
CO4	3	3	2	2	3	3	3	2	3	2	2	2
CO5	3	3	2	2	3	3	3	2	3	2	2	2

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓				✓				

Subject Code: EBCE22I02	Subject Name : TECHNICAL SKILL II - SURVEY CAMP	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Surveying laboratory	IE	0	0/0	2/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

Three weeks survey camp using Theodolite, cross staff, leveling staff, tapes and Plane table

(i) Triangulation

(ii) Trilateration

(iii) Star observation to determine azimuth

(iv) Rectangulation

* Will be accommodated during preceding winter vacation

Students should acquire skill in the domain/inter disciplinary area from government/private training centers/industries /University for a minimum period of 15 calendar days. The training can be through off line, online or mixed mode. Students are supposed to prepare Technical skill report at the end of the training and submit the report along with the certificate in proof of the training, during the viva voce examination conducted by the examiners duly appointed by the head of the department.

Total No of Hrs: 30

REFERENCES

1. Bannister A. and Raymond S., "Surveying " , ELBS,Pune, Sixth Edition, 1992.

2. Heribert Kahmen and Wolfgang Faig, "Surveying " , Walter de Gruyter, 1995.

3. Kanetkar T.P., "Surveying and Levelling", Vols. I and II, United Book Corporation, Pune, 1994.

4. Punmia B.C., "Surveying ", Vols. I, II and III, Laxmi Publications, New Delhi, 1999.

5. Clark D., "Plane and Geodetic Surveying" , Vols. I and II, C.B.S. Publishers and Distributors, Delhi, sixth Edition, 1971.

6. James M. Anderson and Edward M. Mikhail, "Introduction to Surveying ", McGraw Hill Book Company, New Delhi, 1985.

7. Wolf P.R. "Elements of Photogrammetry", McGraw Hill Book Company, New Delhi, 1988

Subject Code: EBCE22ET2	Subject Name : REMOTE SENSING AND GIS	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Geology, Engineering survey	ETL	1	0/0	2/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Introduce the principles of remote sensing to students who are beginners in this field.
- Fundamental knowledge on the physics of remote sensing.
- Aerial photographic techniques, image interpretation techniques ,to create basic understanding of GIS concepts.
- To develop the ability to solve a specific problem right from its identification till the successful solution of the same

COURSE OUTCOMES (COs) : (3- 5)

CO1	Enumerate the concepts of Electro Magnetic energy, spectrum and spectral signature curves for practical problems
CO2	Understand the concepts of satellite, sensors and characteristics of different platforms
CO3	Apply the concepts of DBMS in GIS
CO4	Analyze raster and vector data and modeling in GIS, Apply GIS in land use, disaster management, ITS and resource information system
CO5	Take up challenging practical problems and find solution by formulating proper methodology

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22ET2	Subject Name : REMOTE SENSING AND GIS	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Geology, Engineering survey	ETL	1	0/0	2/0	2
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION TO REMOTE SENSING 9 HRS

Definition – components of remote sensing – , Energy sources and radiation principles, electromagnetic radiation (EMR) –EMR spectrum, active and passive remote sensing – platforms — visible, infra red (IR), near IR, middle IR , thermal IR and microwave – black body radiation - Planck's law – Stefan-Boltzman law.

UNIT II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS 9 HRS

Atmospheric characteristics, scattering of EMR – Raleigh, MIE, non-selective and Raman scattering – EMR interaction with water vapour and ozone – atmospheric windows – significance of atmospheric windows – EMR interaction with earth surface materials – radiance, irradiance, incident, reflected, absorbed and transmitted energy – reflectance – specular and diffuse reflection surface- spectral signature – spectral signature curves – EMR interaction with water, soil and earth surface

UNIT III OPTICAL AND MICROWAVE REMOTE SENSING SYSTEMS 9 HRS

Satellites - classification – based on orbits – sun synchronous and geo synchronous – based on purpose – earth resource satellites, communication satellites, weather satellites, spy satellites, spectral, radiometric and spatial resolutions, Multispectral, thermal and hyper spectral sensing, along and across track scanners – description of sensors in land sat, spot, irs series – current satellites - radar – speckle - back scattering – side looking airborne radar – synthetic aperture radar – radiometer – geometrical characteristics

UNIT IV GEOGRAPHIC INFORMATION SYSTEM 9 HRS

GIS – components of GIS, data – spatial and non-spatial – maps – types of maps – projection – types of projection - raster and vector data structures – comparison of raster and vector data structure – GIS analysis using raster and vector data – DEM for Slope, Aspect, Flow direction, Flow pathways, Flow accumulation, Streams, Catchment area delineation, retrieval, reclassification, overlaying, buffering – data output.

UNIT V IMAGE PROCESSING AND APPLICATIONS OF RS & GIS 9 HRS

Visual interpretation of satellite images – elements of interpretation - interpretation keys, Digital Image Processing - application of remote sensing and GIS – urban applications - integration of GIS and remote sensing – Remote sensing applications for watershed management, Rainfall runoff modeling, Irrigation management, Flood mapping, Drought assessment, Environment and ecology, urban analysis –resources information systems.

PRACTICAL SESSIONS

Include practical sessions for Digitization - Point, Line, Polygon and Surface Data, Building topology – measuring distance and area, Adding attribute data – querying on attribute data, Onscreen digitization - Data Conversion – Vector to Raster, Raster to Vector, Generation of DEM: from contours, spot heights, Vector Analysis – Buffering, Overlay and Network analysis, Data Output: Bar charts, Map compilation

Total No of Hours : 45

TEXT BOOKS ,

1. Anji Reddy, Remote Sensing and Geographical Information Systems, B.S. Publications, New Delhi, 2001
2. M.G. Srinivas (edited by), Remote Sensing Applications, Nervosa Publishing House, New Delhi, 2001.

REFERENCE

1. *Lillesand T.M. And Kiefer R.W. Remote Sensing And Image Interpretation, John Wiley And Sons, Inc, New York, 1987.*
2. *Janza.F.J., Blue, H.M., Johnston, J.E.., "Manual of Remote Sensing Vol.I American Society of Photogrammetry, Virginia, U.S.A, 1975.*
3. *Burrough P.A, Principle Of Gis For Land Resource Assessment, Oxford, 1990*
4. *QGIS-1.8-UserGuide, http://docs.qgis.org/pdf/QGIS-1.8-UserGuide-en.pdf,2013*
5. *Getting to Know ArcGIS for Desktop,ISBN: 9781589483088 2013*
6. *Understanding GIS: An ArcGIS Project Workbook, ISBN: 9781589482425 2011*

VI SEMESTER

Subject Code: EBCE22009	Subject Name : STRUCTURAL ANALYSIS	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Mechanics of Solids, Strength of materials	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
This course introduces students to the classical methods of structural analysis, i.e., methods for calculating forces and displacements in structures due to given loads and imposed deformations. Both determinate and indeterminate structures are covered.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Discover the behavior of arches and suspension bridges under various loads
CO2	To understand the concept of slope deflection method, moment distribution method and plastic analysis
CO3	To apply the method of tension coefficient to determine the member forces in space structures
CO4	To analyze the structures for moving loads and draw influence line diagrams
CO5	To evaluate the shape factor and influence lines of statically determinate structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	1	1	1	1	1	1	3
CO2	3	3	3	3	1	1	1	1	1	1	1	3
CO3	3	3	3	3	1	1	1	1	1	1	1	3
CO4	3	3	3	3	1	1	1	1	1	1	1	3
CO5	3	3	3	3	1	1	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22009	Subject Name : STRUCTURAL ANALYSIS	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Mechanics of Solids, Strength of materials	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I DEFLECTION OF DETERMINATE STRUCTURES 12 Hrs

Principles of virtual work for deflections - Deflections of pin-jointed plane frames and rigid Plane Frames. Introduction to analysis of space trusses using method of tension coefficients – Beams curved in plan.

UNIT II SLOPE DEFLECTION AND MOMENT DISTRIBUTION METHOD 12 Hrs

Analysis of continuous Beams – cantilever beams - Continuous beams and rigid frames (with and without sway) - Symmetry and Asymmetry -Portal Frames. Stiffness and carry over factors –Balance – Distribution and carryover of moments - Analysis of continuous Beams - Plane rigid frames with and without sway – Structural frames

UNIT III MOVING LOADS AND INFLUENCE LINES (DETERMINATE) 12 Hrs

Influence lines for reactions in statically determinate structures – influence lines for member forces in pin jointed frames – Influence lines for shear force and bending moment in beam sections

UNIT IV ARCHES AND SUSPENSION BRIDGES 12 Hrs

Arches structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects

Analysis of suspension bridges – Un stiffened cables and cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders.

UNIT V MATRIX METHOD FOR INDETERMINATE FRAMES AND PLASTIC ANALYSIS 12 Hrs

Equilibrium and compatibility - Determinate Vs indeterminate structures –Indeterminacy - primary structure - Compatibility conditions - Analysis of indeterminate pin-jointed plane frames, continuous beams. Element and global stiffness and flexibility matrices– Co-ordinate transformations – transformations of stiffness matrices - Analysis of Continuous Beams.

Total no of hrs: 60

TEXT BOOKS

1. R.Vaidyanathan, P.Perumal,, Comprehensive Structural Analysis Vol 1 and vol.2, Laxmi Publications, 2004
2. Bhavikatti S.S Structural Analysis Vol 1 and vol.2, Vikas Publishing House Pvt. Ltd New Delhi
3. S.Ramamrutham, R.Narayan, Theory of structures, Dhanpatrai publications,1993

REFERENCES

1. *Analysis of Structures: Strength and Behaviors T.S. Thandavamoorthy, oxford University press, New Delhi, 2005.*
2. *Matrix analysis of framed structures – William Weaver, Jr & James M.Gere, CBS Publishers & Distributors, Delhi, 1995*
3. *Structural Analysis – A Matrix Approach – G.S.Pandit & S.P.Gupta, Tata McGraw-Hill, New Delhi, 1998*
4. *Manicka Selvam V.K.,Elementary Matrix Analysis of Structures, Khanna Publishers Mumbai,1990.*
5. *Coates R.C., Coutie M.G. and Kong F.K., Structural Analysis, ELBS and Nelson, Newjersey,1990.*

Subject Code:	Subject Name: DESIGN OF CONCRETE STRUCTURES	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22010	Prerequisite: Structural Analysis	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The purpose of this study is to impart comprehensive knowledge on the design of reinforced concrete structural elements such as beams, columns, slabs and footings. Brings about an understanding of the behavior of reinforced concrete and the design philosophies

COURSE OUTCOMES (COs) : (3- 5)
At the end of the course, the student will be able to:

CO1	Understanding the behavior of reinforced concrete and the design philosophies
CO2	Applying the concept of Concrete design to making the projects.
CO3	Analyze and Practicing the design concepts with Indian Standard codes
CO4	Evaluate the design methods for concrete elements
CO5	To create comprehensive knowledge on the design of reinforced concrete structural elements such as beams, columns, slabs and footings

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code:	Subject Name: DESIGN OF CONCRETE STRUCTURES	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22010	Prerequisite: Structural Analysis	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION, LIMIT STATE DESIGN OF BEAMS AND SLABS 12 Hrs

Properties of different grades of concrete and steel, Behavior of RC members, Permissible stresses - Stress block parameters, Stress strain relationship - Failure criteria Analysis - Introduction to IS 456-2000, SP: 16 - Design and detailing of singly reinforced & doubly reinforced beam - Design and detailing of one-way and two-way slab panels – Flat Slabs (Design of beams and slabs for combined shear, bending and torsion).

UNIT II LIMIT STATE DESIGN OF COLUMNS AND FOOTINGS 12 Hrs

Basic assumptions - Design and detailing of reinforced concrete short columns of rectangular and circular cross sections under axial load - Column under compression and bi axial bending using IS 456:2000 - Design and detailing of isolated footing for column subjected to axial loads, Design and detailing of Axially and eccentrically loaded Rectangular footings, Design and detailing of Combined Rectangular footings for Two Columns.

UNIT III DESIGN OF STAIRCASE AND WATER TANK 12 Hrs

Introduction to ductile detailing & provisions of IS 13920, Design of Staircases - Design of circular and rectangular water tanks resting on ground. Design of staging and foundations

UNIT IV RETAINING WALLS 12 Hrs

Design of retaining walls – Cantilever and Counter fort retaining walls

UNIT V YIELD LINE THEORY AND INTRODUCTION TO BRICK MASONRY 12 Hrs

Application of virtual work method to square, rectangular, circular and triangular slabs, Design of masonry walls, and pillars as per NBC and IS codes

Total No of Hrs: 60

TEXT BOOKS

1. N.Krishna Raju "Design of Reinforced Concrete Structures", CBS publishers & Distributors. Latest Edition, IS456:200.
2. S.Ramamrudham ,Design of Reinforced Concrete Structures, Dhanpat Rai publishing company(p) Ltd New Delhi.
3. Varghese P C, Limit State Design of Reinforced Concrete, Prentice Hal of India, Private, Limited New Delhi, 1997.

REFERENCES

1. *Ashok K. Jain Reinforced concrete- Limit state design- New chand & Bros, Roorkee 1997.*
2. *Dayarathnam.P, Brick and Reinforced Brick Structures, Oxford and IBH Publishing House, 1999.*
3. *IS: 456- 2000 "Indian Standard for Plain and reinforced concrete – code of practice "Bureau of Indian Standard".*
4. *A.P Arul Manikam "Structural Engineering" .*
5. *Design aids to IS 456-1978 (SP16).*
6. *SP 34 Handbook on Concrete Reinforcement and Detailing, BIS 1987.*
7. *IS 1905:1987, Code of practice for structural use of unreinforced masonry Bureau of Indian Standards.*

Subject Code: EBCE22011	Subject Name : FOUNDATION ENGINEERING	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Soil Mechanics	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- At the end of this course student acquires the capacity to investigate the soil condition and to design suitable foundation

COURSE OUTCOMES (COs) : (3- 5)

CO1	Discover the behavior and nature of the soil
CO2	Understand reason behind the structure and foundation failure
CO3	Apply the principles of soil mechanics to decide upon the suitability of shallow or deep foundations
CO4	To analyze the critical failure modes of retaining walls
CO5	To evaluate the load carrying capacity of various shallow and deep foundations

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22011	Subject Name : FOUNDATION ENGINEERING	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Soil Mechanics	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I : SOIL EXPLORATION **12 Hrs**

Scope and objectives – method of exploration – angering and boring – wash boring and rotary drilling – depth of boring – spacing of bore hole - sampling –representative and undisturbed - sampling – sampling techniques –split spoon sampler,thin tube sampler,stationary piston sampler - bore log and report – penetration tests (spt and scpt) .

UNIT II : SHALLOW FOUNDATION **12 Hrs**

Introduction – location and depth of foundation – codal provisions – bearing capacity of shallow foundation on homogeneous deposits – terzaghi's formula and bis formula – factors affecting bearing capacity – problems- bearing capacity from in situ tests(spt, scpt and plate load) allowable bearing pressure – components of settlement – determination of settlement of foundation on granular and clay deposit – total and differential settlement – allowable settlement –- codal provisions .

UNIT III : FOOTINGS AND RAFTS **12 Hrs**

Types of foundation – contact pressure distribution below footings, design of footings, Isolated footing, combined footings ,mat foundation - types - Applications-proportioning- floating foundation .

UNIT IV : PILE FOUNDATION **12 Hrs**

Types of piles and their function – factors influencing the selection of pile – carrying capacity of single pile in granular and cohesive soils – static formulae - dynamic formulae (engineering news and hiley's) – capacity from insitu tests (spt and scpt) – negative skin friction - uplift capacity – group capacity by different methods(feld's rule,converse-labarra formula and block failure criterion) – settlement of pile groups – interpretation of pile load test(routine test only) – forces on pile caps – under reamed piles – capacity under compression and uplift .

UNIT V : RETAINING WALLS **12 Hrs**

Plastic equilibrium in soils – active and passive states – rankine's theory – cohesionless, effect of water table and cohesive soil - coloumb's wedge theory – condition for critical failure plane - earth pressure on retaining walls of simple configurations – graphical methods (rebhann and culmann's method)– stability analysis of retaining walls.

Total No of Hrs: 60

TEXT BOOKS

- Arora, k.r. Soil Mechanics And Foundation Engineering, Standard Publishers And Distributors, New Delhi, 1997.
- Gopal Ranjan and Rao, A.S.R. Basic and Applied Soil Mechanics, Wiley Eastern Ltd., New Delhi (India), 1997.
- V.N.S. Moorthy, " Soil Mechanics And Foundation Engineering ", Ubs Publications And Distribution Ltd, New Delhi, 1999.

REFERENCES

- Bowles J.E. Foundation Analysis And Design, McGraw hill, 1994.
- Dass, B.M , "Principles Of Geotechnical Engineering", Thompson Books, Singapore ,5th edition, 2003
- Kaniraj, S.R," Design Aids In Soil Mechanics And Foundation Engineering", Tata Mcgraw Hill Publishing Company Ltd , New Delhi ,2002
- Swamisaran, "Analysis And Design Of Structures – Limit State Design", Oxford Ibh Publishing Co Pvt Ltd. New delhi , 1998

Subject Code: EBCE22L07	Subject Name : CONCRETE LABORATORY	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Building Materials	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- The objective of the concrete lab is to test the basic properties ingredients of concrete, fresh and hardened concrete properties.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Outline the importance of testing of cement, fine and coarse aggregates and its properties
CO2	Understand the concept of workability and testing of fresh and hardened concrete
CO3	Demonstrate and conduct experiment on cement, fine aggregates, coarse aggregates and concrete
CO4	Compare the strength properties of different grades of concrete
CO5	Assess the different properties of cement, fine aggregates, coarse aggregates and concrete

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22L07	Subject Name : CONCRETE LABORATORY	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Building Materials	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

LIST OF EXPERIMENTS

UNIT I : CEMENT **15 Hrs**

1. Test for fineness
2. Test for setting times including normal consistency test
3. Mortar cube preparation and testing

UNIT II : AGGREGATES **15 Hrs**

1. Sieve analysis test - Grade Curves
2. Crushing Value - Test
3. Test on Aggregates - Los Angeles Abrasive Testing Machine

UNIT III : CONCRETE: **15 Hrs**

1. Cube compression test
2. Tension test of concrete - cylinder split test
3. Flexural test on concrete specimen
4. Test using Vee Bee consistometer
5. Compaction factor test
6. Mix design using test parameters and assessing the strength of concrete

Total No of Hrs: 45

TEXT BOOKS

1. Shetty. M.S., Concrete Technology, S.Chand and Co, Pune,1984

REFERENCES

1. *Krishnasamy. K.T., Concrete Technology, Dhanapt Rai - New Delhi – 1985*
2. *Neville, properties of concrete elbs, 1977.*

Subject Code: EBCE22L08	Subject Name : IRRIGATION AND ENVIRONMENTAL ENGINEERING DRAWING	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Irrigation Engineering, Environmental Engineering	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- The purpose of this course is to impart the knowledge about the design of irrigation and environmental engineering structures.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Hands-on experience in drawing of irrigation engineering structures
CO2	Hands-on experience in drawing of environmental engineering structures
CO3	To draw plan elevation and section of structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	3	3	-	2	-
CO2	3	-	-	-	-	-	-	3	3	-	2	-
CO3	3	-	-	-	-	-	-	3	3	-	3	-

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22L08	Subject Name : IRRIGATION AND ENVIRONMENTAL ENGINEERING DRAWING	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Irrigation Engineering, Environmental Engineering	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I IMPOUNDING STRUCTURES 10 Hrs

Gravity dam, Tank Surplus Weir, Tank Sluice with tower road – Drawing showing plan, Elevation, half section including foundation details.

UNIT II CANAL TRANSMISSION STRUCTURES 10 Hrs

Aqueducts – Syphon Aqueducts – Super passage – Canal siphon – Canal Drops- Drawing Showing plan, elevation and foundation details.

UNIT III CANAL REGULATION STRUCTURES 10 Hrs

Canal head works- Canal Regulator – Canal escape- Proportional Distributors – Drawing showing detailed plan, elevation and foundation.

UNIT IV WATER SUPPLY AND TREATMENT 5 Hrs

Design & Drawing of flocculate, clarifier – Rapid sand filter – House service connection for water supply and drainage.

UNIT V SEWAGE TREATMENT & DISPOSAL 10 Hrs

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank – Secondary clarifiers – Sludge digester – Sludge drying beds – Waste stabilization ponds - Septic tanks and disposal arrangements – Manholes.

Total No of Hrs: 45

TEXT BOOKS

1. Modi, P.N., "Environmental Engineering I & II", Standard Book House, Delhi – 6
2. Sathyanarayana Murthy "Irrigation Design and Drawing" Published by Mrs L.Banumathi, Tuni east Godavari District.A.P. 1998.
3. Sharma R.K. Irrigation Engineering and Hydraulic Structures Oxford and IBH Publishing co., New Delhi 2002.

REFERENCES

1. *Peary, H.S., ROWE, D.R., Tchobanoglous, G., "Environmental Engineering", McGrawHill Book Co., New Delhi, 1995.*
2. *Metcalf & Eddy, "Wastewater Engineering (Treatment and Reuse)", 4thedition, Tata McGraw-Hill, New Delhi, 2003.*
3. *Garg S.K., "Irrigation Environmental Engineering and design StructuresI", Khanna Publishers, New Delhi, 17th Reprint, 2003.*
4. *Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999*
5. *Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi.*

Subject Code: EBCC22I07	Subject Name : Soft Skill – II (Qualitative and quantitative skills)	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Soft Skills – I	IE	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The main objective is to strengthen the logical and arithmetic reasoning skills of the students.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Recognize and apply arithmetic knowledge in a variety of contexts.
CO2	Ability to identify and critically evaluate philosophical arguments and defend them from criticism.
CO3	Define data and interpret information from graphs.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	1	1	3	2	3	3
CO2	2	2	2	3	1	3	1	3	3	3	3	1
CO3	3	3	3	3	3	3	2	2	3	3	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
								✓				

Subject Code: EBCC22I07	Subject Name : Soft Skill – II (Qualitative and quantitative skills)	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Soft Skills – I	IE	0	0/0	2/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I Logical Reasoning I

Logical Statements – Arguments – Assumptions – Courses of Action.

UNIT II Logical Reasoning II

Logical conclusions – Deriving conclusions from passages – Theme detection.

UNIT III Arithmetical Reasoning I

Number system – H.C.F & L.C.M – Problem on ages – Percentage – Profit & Loss – Ratio & Proportion – Partnership.

UNIT IV Arithmetical Reasoning II

Time & Work – Time & Distance – Clocks – Permutations & Combinations – Heights & Distances – Odd man out and Series.

UNIT V Data Interpretation

Tabulation – Bar graphs – Pie graphs – Line graphs.

PRACTICE SESSIONS

Include practice sessions to discuss in both basic written English and concepts of manipulating mathematics.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total No of Hrs: 30

Reference Book:

1. R.S.Agarwal, A modern approach to Logical Reasoning, S.Chand & Co., (2017).
2. R.S.Agarwal, A modern approach to Verbal and Non verbal Reasoning, S.Chand & Co., (2017).
3. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S.Chand & Co., (2017).
4. A.K.Gupta, Logical and Analytical Reasoning, Ramesh Publishing House, (2014).
5. B.S.Sijwali, Indu sijwali, A new approach to Reasoning (Verbal and Non verbal), Arihant Publishers, (2014).

Subject Code: EBCE22I03	Subject Name : **TECHNICAL SKILL III** **DETAILING OF R.C. AND STEEL STRUCTURES**	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Design of Concrete Structures, Building Drawing Practice	IE	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE To Impart knowledge on design of various structural elements in civil engineering

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquire knowledge on detailing of RC and steel structural elements
CO2	Able to correlate theoretical knowledge with practical training
CO3	Prepare detailing drawing of RC and steel structural elements
CO4	Analyze the load carrying capacity of structural elements for the given loading
CO5	May extend the software knowledge for research purpose

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	3	3	1	1	1	2	1	3	3
CO2	3	3	3	3	3	1	1	1	2	1	3	3
CO3	3	3	3	3	3	1	1	1	2	1	3	3
CO4	3	3	3	3	3	1	1	1	2	1	3	3
CO5	3	3	3	3	3	1	1	1	2	1	3	3

COs / PSOs	**PSO1**	**PSO2**
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓				✓				

Subject Code: EBCE22I03	Subject Name : **TECHNICAL SKILL III** **DETAILING OF R.C. AND STEEL STRUCTURES**	**Ty / LB/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Design of Concrete Structures, Building Drawing Practice	IE	0	0/0	2/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

Students should acquire skill in the domain/inter disciplinary area from government/private training centres/industries /University for a minimum period of 15 calendar days. The training can be through off line, online or mixed mode. Students are supposed to prepare Technical skill report at the end of the training and submit the report along with the certificate in proof of the training, during the viva voce examination conducted by the examiners duly appointed by the head of the department.

Course Outline:

Student should learn about detailing of Reinforced concrete structures and steel structures detailing and quantity of steel calculation.

R.C.C MEMBER

1. One way slab
2. Two way slab
3. Cantilever slab
4. Beam
5. Column
6. Footing

STEEL STRUCTURES

1. Roof Trusses
2. Beam Column joint
3. Gantry Girder
4. Plate Girder

Total No of Hrs: 30

TEXT BOOKS

1. N.Krishna Raju "Design of Reinforced Concrete Structures", CBS publishers & Distributors. Latest Edition, IS456:200.
2. S.Ramamrudham ,Design of Reinforced Concrete Structures, Dhanpat Rai publishing company(p) Ltd New Delhi.
3. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800–2007, IK International Publishing House Pvt. Ltd., 2009
4. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005

REFERENCES

1. *IS: 456- 2000 "Indian Standard for Plain and reinforced concrete – code of practice "Bureau of Indian Standard".*
2. *Design aids to IS 456-1978 (SP16).*
3. *SP 34 Handbook on Concrete Reinforcement and Detailing, BIS 1987.*
4. *IS 800 :2007, General Construction In Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007*
5. *Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002*

Subject Code: EBCE22I04	Subject Name : MINI PROJECT / INTERNSHIP	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: ALL	IE	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To develop technical skill and practical learning in field work

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student will possess sound knowledge and experience in construction field
CO2	Student will be able to understand the practical aspects of construction domain
CO3	Student will be able to prepare report based on the experience gained
CO4	Student can correlate theoretical knowledge with practical experience
CO5	Students will be able to develop new ideologies in construction field based on the experience gained

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	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
CO5	3	3	3	3	3	3	3	3	3	3	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓				✓				

Subject Code: EBCE22I04	Subject Name : MINI PROJECT / INTERNSHIP	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: ALL	IE	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

INTERNSHIP:

Students are supposed to undergo internship in related Industries for a minimum period of 30 days cumulatively during the semester. They have to prepare a report on the Internship with a certificate in proof from competent authority in the industry. At the end of the semester Viva-Voce examination will be conducted by the Examiners duly appointed by the Head of the department and the students will be evaluated.

MINI PROJECT:

Students are supposed to do mini project in any one of the below mentioned domains:

1. Soil Investigation
2. Construction-different types of foundation, Highways and Embankments
3. Prestressing- Bridges
4. Industrial Structures- steel-fabrication and erection
5. Specification for various works- measurement and Billing
6. Architectural plan
7. Latest design and analysis civil Engineering software

Total No of Hrs: 45

VII SEMESTER

Subject Code:	Subject Name :	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22012	**DESIGN OF STEEL STRUCTURES**					
	Prerequisite: Structural analysis	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE:

- To introduce the student to material behaviour and Load and Resistance Factor Design methodology.
- To design and analyze tension members and compression members.

COURSE OUTCOMES (COs) : (3- 5)

CO1	The students would have knowledge on the design of structural steel members subjected to compressive, tensile and bending forces, as per current code.
CO2	To understand the connections and their structural efficiency
CO3	Classify and design the structural steel components of industrial building
CO4	To analyze tension, compression and flexural members for the imposed load
CO5	To design structural systems such as roof trusses and gantry girders

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22012	Subject Name : DESIGN OF STEEL STRUCTURES	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Structural analysis	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION 12 Hrs

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Connections using rivets, welding, bolting – Design of bolted and welded joints – Eccentric connections - Efficiency of joints.

UNIT II TENSION MEMBERS 12 Hrs

Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

UNIT III COMPRESSION MEMBERS 12 Hrs

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

UNIT IV BEAMS 12 Hrs

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to uniaxial and biaxial bending – Design of plate girders - Intermediate and bearing stiffeners – Flange and web splices.

UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES 12 Hrs

Roof trusses – Roof and side coverings – Design of purlin and elements of truss; end bearing – Design of gantry girder.

Total No of Hrs: 60

TEXTBOOKS:

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2 nd Edition, 2013.
3. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

REFERENCES:

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002
2. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005
3. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800–2007, IK International Publishing House Pvt. Ltd., 2009
4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007 Structures Publications, 2009.
5. IS 800 :2007, General Construction In Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007

Subject Code:	Subject Name: ESTIMATION AND QUANTITY SURVEYING	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22013	Prerequisite: None	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the functional planning of buildings as per standards
- To study the estimate types and terms involved in estimation
- To study the important specifications necessary for the works in buildings
- To study the concepts of tenders and contracts

COURSE OUTCOMES (COs) : (3- 5)

At the end of this course the student shall be able to

CO1	Prepare various types of estimation and find out the quantity of works involved
CO2	Understand and Prepare specifications for various items of construction works
CO3	Calculate the mortgage, lease and depreciation value of buildings
CO4	Estimate the quantity of works involved in road works, water supply and sanitary works
CO5	Carry out analysis of rates and bill preparation

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	1	1	1	1	1	3	3
CO2	3	3	3	3	1	1	1	1	1	1	3	3
CO3	3	3	3	3	1	1	1	1	1	1	3	3
CO4	3	3	3	3	1	1	1	1	1	1	3	3
CO5	3	3	3	3	1	1	1	1	1	1	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code:	Subject Name: ESTIMATION AND QUANTITY SURVEYING	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22013	Prerequisite: None	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I ESTIMATION 12 Hrs

Types of estimates- units of measurements-methods of estimates – advantages- estimation of load bearing and framed structures –estimate of quantities in residential building- calculation of quantities of brick work, RCC, PCC, white washing ,color washing and painting / varnishing – calculation of brick work and RCC works in arches – estimate of joineries for paneled and glazed doors ,windows, ventilators, handrails etc.

UNIT II ESTIMATE OF OTHER STRUCTURES 12 Hrs

Estimating of septic tank, soak pit – Sanitary and water supply installations – Water supply pipe line – Sewer line – Tube well – Open well – Estimate of bituminous and cement concrete roads-estimation of retaining walls and culverts.

UNIT III SPECIFICATIONS AND TENDERS 12 Hrs

Data –schedule of rates- analysis of rates-specifications-sources-detailed and general specifications – tenders- e-tender contracts- contracts types– preparation of tender notice and documents-arbitration and legal requirements

UNIT IV VALUATION 12 Hrs

Necessity – basics of value engineering –capitalized value – depreciation and its methods – escalation _ value of building – calculation of standard rent – mortgage- lease.

UNIT V REPORT PREPARATION AND CASH FLOW 12 Hrs

Principle of report preparation – report on estimate of residential building- commercial building -culvert – roads – water supply and sanitary installations – tube wells – open wells.

Total No of Hrs: 60

TEXT BOOKS

1. B.N.Dutta, Estimating And Costing In Civil Engineering –UBS publishers and distribution Pvt Ltd, 2003.
2. Mr. B.Kanagasabapathy, M/S. Ehilalarasi Kanagasabapathy,Practical Valuation – Vol I, Thiruchirappalli, 1995.
3. Kohl, D.D and Kohli, R.C., “A Text Book of Estimating and Costing (Civil)”, S.Chand & CompanyLtd., 2004.
4. Rangwala, “Estimating, Costing and Valuation”, Charotar Publishing House Pvt Ltd., 2012.

REFERENCES

1. *G.S.Birdie, A Text Book On Estimating And Costing, Dhanpat Rai And Sons, New Delhi,1995.*
2. *Mr. B.Kanagasabapathy, M/S. Ehilalarasi Kanagasabapathy, Fixation of Fair Rent , Thiruchirappalli, 1995.*

Subject Code: EBCE22014	Subject Name: CONSTRUCTION MANAGEMENT	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NONE	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To make the students aware of the various construction techniques and practices.
- To introduce a concepts of projects formulation

COURSE OUTCOMES (COs) : (3- 5)

CO1	The student should be able to plan construction projects, schedule the activities using network diagrams
CO2	Determine the cost of the project, control the cost of the project by creating cash flows and budgeting and to use the project information as decision making tool
CO3	Knowledge about different methods of planning
CO4	Analyze construction documents for planning and management of construction processes
CO5	Apply electronic based technology to manage the construction process

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22014	Subject Name: CONSTRUCTION MANAGEMENT	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NONE	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I NETWORK TECHNIQUES 12 Hrs

Introduction to network techniques - Use of CPM and PERT for planning - Scheduling and control of construction work, bar charts Error in networks, Types of nodes and node numbering systems.

UNIT II CONSTRUCTION PLANNING 12 Hrs

Basic concepts in the development of construction plan - Planning for construction and site facilities using networks - Preparation of construction schedules for jobs, materials, and equipment using CPM. .

UNIT III COST CONTROL OF CONSTRUCTION 12 Hrs

Construction quality control and inspection - Significance of variability and estimation of risks - Construction cost control - Crashing of networks.

UNIT IV QUALITY AND SAFETY DURING CONSTRUCTION 12 Hrs

Importance of Quality and safety – Organizing for quality and safety – safety measures – Prevention of fire at construction site – Elements and organization of quality - Quality assurance techniques.

UNIT V MANAGEMENT INFORMATION SYSTEM 12 Hrs

Definition of MIS – Requirement of MIS – Database approach – Types of project information – Accuracy and use of information.

Total No of Hrs: 60

TEXT BOOKS

1. Chitkara, K.K "Consruction Project Management Planning "Scheduling And Control, Tata Mc Graw – Hill Publishing Co., Newdelhi, 1998.
2. S. Seetharaman - Construction Engineering & Management, Dhanpat Rai Publications ,Pune,1995.

REFERENCES

1. *Construction Management - Sangareddy And Meyyappan,Prathibha Publications,Cbe,1994.*
2. *Moder. J., C. Phillips And Davis, "Project Management With Cpm, Pert And Precedence Diagramming,1999.*
3. *Prasanna Chandra, " Project Management ", Tmh ,New Delhi,1997.*

Subject Code: EBCE22015	Subject Name : TRANSPORTATION ENGINEERING	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Soil Mechanics, Surveying	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand the aspects of design, construction and maintenance of tracks for the safe and efficient movement of public and goods.
- To have an overall knowledge of the design and construction of Highway, airport, docks, harbors and ports as a whole.
- To develop the ability to solve a specific problem right from its identification till the successful solution of the same

COURSE OUTCOMES (COs) : (3- 5)

CO1	Thorough knowledge on planning, design, construction of highway, railway, airport and docks
CO2	Ability to understand planning, construction and maintenance aspects of highways, Railways, Airports and Harbor
CO3	Ability to take up challenging practical problems and find solution by formulating proper methodology
CO4	Analyze the geometric aspects to plan the shortest route
CO5	Evaluate the requirements for construction of docks and harbors

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Subject Code: EBCE22015	Subject Name : TRANSPORTATION ENGINEERING	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Soil Mechanics, Surveying	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I : HIGHWAY PLANNING AND ALIGNMENT 9 Hrs

Significance of highway planning –History of road development in India – Classification of highways – Locations and functions – Factors influencing highway alignment – Soil suitability analysis - Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II: GEOMETRIC DESIGN OF HIGHWAYS 9 Hrs

Typical cross sections of Urban and Rural roads — Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses.

UNITIII: RAILWAYS PLANNING CONSTRUCTION AND MAINTENANCE 10 Hrs

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, - Track Stress, coning of wheels, creep in rails, defects in rails - Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings. Tunneling Methods, drainage and ventilation –Calculation of Materials required for track laying - Construction and maintenance of tracks – Modern methods of construction & maintenance

UNIT IV: AIRPORT PLANNING & DESIGN 9 Hrs

Airport planning, components of airports, airport site selection Runway design- orientation, geometric design and correction for gradients Terminal area, airport layout, airport buildings, passenger facilities, parking area and airport zoning

UNIT V: HARBOUR ENGINEERING 8 Hrs

Definition of terms - harbors, ports, docks, tides and waves. Harbors – requirements, classification – site investigation for locations, planning and layouts Terminal facilities – port buildings, warehouse, transit sheds, inter-modal transfer facilities, mooring accessories, navigational aids coastal structures piers, breakwaters, wharves, jetties, quays.

Total No of Hrs: 45

TEXT BOOKS

1. Saxena Subhash C and Satyapal Arora, A Course In Railway Engineering, Dhanpat Rai And Sons, Delhi, 1998.
2. Khanna S K, Arora M G and Jain S S, Airport Planning And Design, Nemchand And Brothers, Roorkee, 1994.
3. Khanna K And Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
4. Kadiyali l r, Principles and Practice of Highway Engineering, Khanna technical Publications, Delhi
5. Dr K.P.Subramaniyam, Transportation Engineering, Scitech Publishers, Chennai 2003

REFERENCES

1. *IRC standards, 2002*
2. *Bureau of Indian Standards (bis) publications on highway materials, 1998*
3. *Rangwala, Railway Engineering, Charotar Publishing House, Mumbai, 1995*

Subject Code: EBCE22L09	Subject Name: **Structural design studio**	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Structural Analysis	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Student should be aware of computer application of structural design

COURSE OUTCOMES (COs) : (3- 5)

CO1	Verify theoretical formulas by conducting experiments
CO2	Analyze statically determinate beams, trusses
CO3	Develop projects based on industrial and field requirements
CO4	Determine deflections of beams and frames using classical methods
CO5	Analyze the bridge decks for moving loads

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22L09	Subject Name: **Structural design studio**	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Structural Analysis	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

LIST OF EXPERIMENTS

1. Program for Design of Slabs. Using Excel
2. Program for Design of Beams. Using Excel
3. Program for Design of Column and Footing Using Excel
4. Introduction to staad pro - Joint, Member/Element, Mesh Generation with flexible user-controlled numbering
5. Analyse and design any beam with any loading type and any kind of supports.
6. Analyse and design of any 2D Frame with any loading type for any load sets.
7. Portal frame with 5 load combinations- Analysis
8. Analyse steel structures with truss elements.

Total No of Hrs: 45

TEXT BOOKS

1. N.Krishna Raju "Design of Reinforced Concrete Structures", CBS publishers & Distributors. Latest Edition, IS456:200.
2. S.Ramamrudham ,Design of Reinforced Concrete Structures, Dhanpat Rai publishing company(p) Ltd New Delhi.
3. Varghese P C, Limit State Design of Reinforced Concrete, Prentice Hal of India, Private, Limited New Delhi, 1997.
4. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800–2007, IK International Publishing House Pvt. Ltd., 2009
5. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005

REFERENCES

1. *Dayarathnam.P, Brick and Reinforced Brick Structures, Oxford and IBH Publishing House, 1999.*
2. *IS: 456- 2000 "Indian Standard for Plain and reinforced concrete – code of practice "Bureau of Indian Standard".*
3. *Design aids to IS 456-1978 (SP16).*
4. *SP 34 Handbook on Concrete Reinforcement and Detailing, BIS 1987.*
5. *IS 800 :2007, General Construction In Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007*
6. *Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002*

Subject Code: EBCE22L10	Subject Name : TRANSPORTATION ENGINEERING LABORATORY	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Transportation Engineering	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The objectives of these laboratory experiments are to determine specific gravity (bulk and apparent), absorption capacity, and fineness modulus of a fine aggregate sample and to plot a gradation curve for the sample.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course the student shall possesses

CO1	Know about the different properties of material used in construction of roads
CO2	Understand the importance of aggregates used in highway construction
CO3	Determine the characteristics of pavement materials
CO4	Analyze the deflection of pavement through Benklemann Beam apparatus
CO5	Evaluate the suitability of bitumen to be used for road construction based on the tests carried out

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22L10	Subject Name : TRANSPORTATION ENGINEERING LABORATORY	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Transportation Engineering	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

LIST OF EXPERIMENTS

1. CBR Test of Given soil sample.
2. Grading Of aggregates.
3. Water Absorption Test on aggregates
4. Abrasion test on aggregates.
5. Impact Test On aggregates
6. Bitumen tests
7. Benklemann Beam apparatus.

Total No of Hrs: 45

TEXT BOOKS

1. Khanna, S.K., Justo, C.E.G. and Veeraragavan, A.,"Highway Materials and Pavement Testing", Nem Chand & Bros., Roorkee
2. G. Venkatappa Rao, K. Ramachandra Rao, Kausik Pahari and D.V. Bhavanna
3. Rao.,"Highway Material Testing and Quality Control", I.K. International.
4. L.R.Kadiyali and N.B Lal., "Principles and Practices of Highway Engineering", Khanna Publishers.

REFERENCES

1. *IRC standards, 2002*
2. *Bureau of Indian Standards (bis) publications on highway materials, 1998*
3. *Rangwala, Railway Engineering, Charotar Publishing House, Mumbai, 1995*

Subject Code: EBCE22I05	Subject Name: **PROJECT PHASE-I**	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: ALL	IE	0	0/0	3/3	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To guide the students such a way that the students carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Work in a team and develop multidisciplinary, research skills
CO2	Understand how to identify the issues and challenges of industry
CO3	Prepare report on the application of emerging technologies in the Construction industry
CO4	Explore innovative ideas in civil engineering design field
CO5	Develop design projects based on industrial and field requirements

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	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
CO5	3	3	3	3	3	3	3	3	3	3	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22I05	Subject Name: **PROJECT PHASE-I**	**Ty / LB/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: ALL	IE	0	0/0	3/3	2
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

Students are expected to do the Project in a group of 3 to 4 students. They should identify the area/topic of the Project and should collect the literatures related to the project. Students intending to do Industrial projects will approach the industries with the support of the university, identify the industrial problem and finalize the project. In case of Industrial projects apart from Industry guide, a guide has to be appointed by the department. At the end of the Semester the students should submit their Project Phase - I report to the Department and Viva -Voce examination will be conducted by the examiners duly appointed by the Head of the department.

OBJECTIVE

To guide the students such a way that the students carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations

- The project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to civil engineering. Every project work shall have a guide who is a member of the faculty of the university.
- Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusions. This final report shall be typewritten form as specified in the guidelines.
- The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

Total No of Hrs: 45

Subject Code:	Subject Name : Foreign Language	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
EBFL22IXX	Prerequisite: NIL	IE	1	0/0	1/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To recognize the cultural values, practices, and heritage of the foreign country, communicate effectively in a foreign language and interact in a culturally appropriate manner with native speakers of that language.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Achieve functional proficiency in listening, speaking, reading, and writing.
CO2	Develop an insight into the nature of language itself, the process of language and culture acquisition.
CO3	Decode, analyze, and interpret authentic texts of different genres.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	3	1	3	2	3	3	1
CO2	2	1	1	1	1	3	1	3	3	3	3	1
CO3	1	1	2	2	1	3	2	3	2	3	3	1

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
			✓									

Subject Code: EBFL22IXX	Subject Name : Foreign Language	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	IE	1	0/0	1/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

Foreign language is introduced in the curriculum to make the students globally employable. Students should select and register for any one of the foreign languages from the given list. At the end of the course students should be able to read, write and converse the language in the basic level. At the end of the semester the assessment will be done through internal examination by the examiner duly appointed by the head of the department.

LIST OF FOREIGN LANGUAGES

1. French language
2. German language
3. Japanese language
4. Arabic language
5. Chinese language
6. Russian language
7. Spanish language

Total No of Hrs: 30

VIII SEMESTER

Subject Code: EBCC22ID3	Subject Name: **TOTAL QUALITY MANAGEMENT**	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

The student will learn:

- To acquaint the students with the basic concept of Total Quality (TQ)
- To understand the customers' expectations and plan TQM accordingly
- To give understand International Quality Certification Systems – ISO 9000 and other standards
- To understand concepts related to quality of services in contemporary environment

COURSE OUTCOMES (COs) : (3- 5) Students will be able to

CO1	Understand the Quality Policies (Level 2)
CO2	Understand the Concepts of Total Quality Management (Level 2)
CO3	Apply Total Quality Management tools in Industry (Level 3)
CO4	Apply the Modern tools of Quality Control (Level 3)
CO5	Acquiring knowledge about Modern Trends and Concepts in Manufacturing Management (Level 2)

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	-	2	3	3
CO2	-	2	3	3
CO3	-	2	3	3
CO4	-	2	3	3
CO5	-	2	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓					

Subject Code: EBCC22ID3	Subject Name: **TOTAL QUALITY MANAGEMENT**	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

UNIT– I QUALITY POLICY, PLANNING AND MANAGEMENT 9 Hrs

Evolution of quality as a strategy- Definitions of quality, Quality Philosophies of Deming, Crosby and Miller, Service Vs product Quality, Customer focus, Quality and Business performance leadership for quality management, Quality planning, Designing for Quality and Manufacturing for Quality, Vision, Mission statements and Quality policy.

UNIT – II BASIC CONCEPTS F TOTAL QUALITY MANAGEMENT 9 Hrs

Total Quality management- TQM models, human and system Components, Continuous Improvement Strategies, Deming wheel, Internal External Customer concept, Customer satisfaction Index, Customer retention, Team work and team building, Empowerment, TQM culture, Quality Circle, 5S principle, Top Management commitment.

UNIT – III QUALITY MANAGEMENT TOOLS 9 Hrs

Quality management tools - Principles and applications of quality Function deployment, Failure Mode and Effect Analysis (FMEA), Taguichi Techniques, Basic tools- Statistical techniques and graphical tools and diagrams.

UNIT - IV VARIOUS CONCEPTS OF QC TECHNIQUES 9 Hrs

Modern QC techniques - Japanese Production Related Techniques: Just in time (JIT) – Quality circles – Total productive maintenance (TPM) – Kaizen – Kanban – 5S concepts – Toyota production systems – JIDOKA – ANDON etc. Concepts on quality management systems (QMS – ISO 9000 – 2000) – Environmental Management Systems (EMS – ISO – 14000)

UNIT- V MODERN TREND AND CONCEPTS IN MANUFACTURING MANAGEMENT 9 Hrs

Modern Trend and Concept in Manufacturing Management: Business processes reengineering (BPR) – Lean / flexible – manufacturing systems – Six sigma concepts. Quality Leadership-Quality Awards –Quality Tools-Quality Function Deployment.

Total No of Hrs: 45

Reference Books:

1. Jill A. Swift, Joel E.Ross and Vincent K.Omachonu, Peinciples of Total Quality, St.Lucie Press, US, 1998.
2. Samuel K.Ho, TQM, An integrated approach, kogan page India Pvt Ltd, 2002
3. Dale H.N Besterfield et al, Total Quality management, Pearson Education Asia, 2001
4. RoseJ.E. Total Quality ManagementKogan page India Pvt Ltd, 1993.
5. Mullar Max,' Essentials of Materail Management,Amacom

Subject Code: EBCE22L11	Subject Name: **PROJECT PHASE-II**	Ty / LB/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: ALL	Lb	0	0/0	12/12	8

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- The objective of project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to civil engineering.

COURSE OUTCOMES (COs) : (3- 5) Students will be able to

CO1	Work in a team and develop multidisciplinary, research skills
CO2	Understand how to identify the issues and challenges of industry
CO3	Prepare report on the application of emerging technologies in the Construction industry
CO4	Explore innovative ideas in civil engineering design field
CO5	Develop design projects based on industrial and field requirements

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	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
CO5	3	3	3	3	3	3	3	3	3	3	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓					✓			

Subject Code: EBCE22L11	Subject Name: **PROJECT PHASE-II**	**Ty / LB/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: ALL	Lb	0	0/0	12/12	8
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

To make the students to make use of the knowledge and skill developed during their four years of study and to apply them for making an innovative product/process for the development of society and industries. Students are expected to do a Project work either in an Industry or at the University in the field of relevant Engineering /inter-disciplinary /multi-disciplinary area in a group of 3 or 4 students. The work to be carried out in Phase II should be continuation of Phase I. Each group will be allotted a guide based on the area of Project work. In case of industrial Project external guide has to be allotted from Industry. Inter disciplinary/multi-disciplinary project can be done with students of different disciplines as a group. Monthly reviews will be conducted during the semester to monitor the progress of the project by the project review committee. Students have to submit the Project thesis at the end of the semester and appear for the Project Viva-Voce examination conducted by the examiners duly appointed by the Controller of Examination. In case of industrial project certificate in proof has to be included in the report along with the bonafide certificate.

OBJECTIVE

- The objective of project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to civil engineering.
- Every project work shall have a guide who is a member of the faculty of the university.
- Fourteen periods per week shall be allotted in the time table for this important activity and this time shall be utilized by the students to receive directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars the progress made in the project.
- Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusions.
- Final report shall be typewritten form as specified in the guidelines. The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

PROGRAM ELECTIVE - I

Subject Code: EBCE22E01	Subject Name : ENGINEERING GEOLOGY	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand the importance of geological knowledge such as earth, earthquake and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor as well as to choose types of foundation

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Identify and classify rock using basic geologic classification systems
CO2	Understand geologic concepts and approaches.
CO3	Identify the various lithological units and its applications in civil engineering
CO4	Analyze the different rocks and minerals based on their property
CO5	Evaluate the geological conditions necessary for construction of dams, tunnels, buildings and road cuttings

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code: EBCE22E01	Subject Name : ENGINEERING GEOLOGY	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I GENERAL GEOLOGY 9 Hrs

Geology in civil engineering - branches of geology - earth structure and composition - elementary knowledge on continental drift and plate tectonics. Seismo tectonics of the Indian plate, seismic zones of India, Weathering - work of rivers, wind, glaciers.

UNIT II MINERALOGY 9 Hrs

Physical properties of minerals - study of rock forming minerals - quartz family. Feldspar family, augite, hornblende, biotite, muscovite, calcite, garnet - properties, behavior and engineering significance of clay minerals –fundamentals of process of formation of ore minerals - coal and petroleum - their origin and occurrence in India.

UNIT III PETROLOGY 9 Hrs

Classification of Soil and Rock, Types of rock and origin: Igneous (extrusive and intrusive), sedimentary and metamorphic rocks, description occurrence, engineering properties of following rocks. Igneous rocks - granite, diorite, gabbro, pegmatite, dolerite and basalt sedimentary rocks sandstone, limestone, shale, conglomerate and breccia. Metamorphic rocks, quartzite, marble, slate, phyllite, gneiss and schist.

UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD 9 Hrs

Strength Behavior of Soil and Rock , Stress and strain in rock, failure and shear failure of soil and rock, folds, faults and joints in rock, consequences of failure (earthquakes), Bearing on engineering construction. Seismic and electrical methods for civil engineering investigations.

UNIT V GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING 9 Hrs

Geologic Mapping and Remote Sensing, Topographic maps, geologic maps, aerial photographs, LIDAR, SAR, interpretation for civil engineering projects - geological conditions necessary for construction of dams, tunnels, buildings, road cuttings, landslides - causes and preventions. Sea erosion and coastal protection.

Total No of Hrs: 45

TEXT BOOKS

1. Parbin singh, “Engineering and General geology ", S. K. Kataria & Sons, 2009
2. D. Venkat Reddy “Engineering Geology”, Vikas publishing House New Delhi, 2010
3. Krynine and Judd, “Engineering Geology and Geotechniques ", McGraw Hill Book Company, New Delhi 1990.

REFERENCE

1. *Legeet, “Geology and Engineering ", McGraw Hill Book Company, New Delhi*
2. *Blyth, “Geology for Engineers ", elbs, Pune 1995*

Subject Code:	Subject Name	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	CLEANER PRODUCTION					
EBCE22E02	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To develop a basic knowledge about the cleaner production and apply the same in the field application.
- To educate the students on complete management principles related to Cleaner Production and Control of Industrial Pollution.

COURSE OUTCOMES (COs) : (3- 5)

The students completing the course will have an

CO1	Understanding sustainable development and cleaner production concept
CO2	Applying the concept of cleaner Production
CO3	Analyze and implement cleaner production program
CO4	Evaluate the Process and equipment optimization, reuse, recovery, recycle, raw material substitution.
CO5	To create comprehensive knowledge to conduct waste audit in an industry and implement waste minimization techniques

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	3	3	3	3	1	1	1	3	3
CO2	3	3	3	3	3	3	3	1	1	1	3	3
CO3	3	3	3	3	3	3	3	1	1	1	3	3
CO4	3	3	3	3	3	3	3	1	1	1	3	3
CO5	3	3	3	3	3	3	3	1	1	1	3	3

COs / PSOs	**PSO1**	**PSO2**
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code:	Subject Name **CLEANER PRODUCTION**	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E02	Prerequisite: NIL	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION 9 Hrs

Sustainable Development - Indicators of Sustainability - Sustainability Strategies - Barriers to Sustainability – Cleaner Production (CP) in Achieving Sustainability - Environmental Policies and Legislations - Regulations to Encourage Pollution Prevention and Cleaner Production – Regulatory versus Market Based Approaches

UNIT II CLEANER PRODUCTION CONCEPT 9 Hrs

Definition - Importance - Benefits - Promotion - Barriers - Role of Industry, Government and Institutions - Environmental Management Hierarchy - Source Reduction Techniques - Process and equipment optimisation, reuse, recovery, recycle, raw material substitution.

UNIT III CLEANER PRODUCTION PROJECT DEVELOPMENT AND IMPLEMENTATION 9 Hrs

Overview of CP Assessment Steps and Skills, Preparing for the Site Visit, Information Gathering, and Process Flow Diagram, Material Balance, Establishing a Program - Organizing a Program - Preparing a Program Plan - Measuring Progress - Pollution Prevention and Cleaner Production Awareness Plan - Waste audit - Environmental Statement.

UNIT IV LIFE CYCLE ASSESSMENT 9 Hrs

Elements of LCA - Life Cycle Costing - Eco Labelling - Design for the Environment – International Environmental Standards - ISO 14001 - Environmental audit.

UNIT V CASE STUDIES 9 Hrs

Industrial applications of CP, LCA, EMS and Environmental Audits.

Total No of Hrs: 45

REFERENCES

1. *Paul L Bishop (2000) " Pollution Prevention: Fundamentals and Practice " McGraw-Hill International New York.*
2. *World Bank Group (1998) "Pollution Prevention and Abatement Handbook"*
3. *"Towards Cleaner Production ", World Bank and UNEP, Washington D.C.*
4. *Prasad modak, C.Viswanathan and Mandar parasnis (1995)"Cleaner Production Audit ", Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok.*

Subject Code: EBCE22E03	Subject Name **BUILDING TECHNOLOGY AND HABITAT ENGINEERING**	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: none	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To select appropriate construction materials and practices in construction field.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Understanding the various materials used in building construction
CO2	Applying the concept of climate and its influence in construction
CO3	Analyze and Practice the importance of thermal control, ventilation and air movement in building.
CO4	Evaluate the design and application methods of geosynthetic materials
CO5	To create New Technology in Building construction

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code: EBCE22E03	Subject Name **BUILDING TECHNOLOGY AND HABITAT ENGINEERING**	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: none	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I BUILDING STONES 9 Hrs

Requirement of good building stone- characteristics - testing.Lime: Properties- Classifications -Manufacture - Testing of lime. Pozzolona: Natural and Artificial pozzolonas. Timber - Defects - Seasoning - Decay - Preservation, Tiles- Flooring and roofing tiles-specification-tests. Paints varnishes and distempers, Common constituents, types and desirable properties.

UNIT II MISCELLANEOUS MATERIALS 9 Hrs

Insulating Materials - Thermal and sound insulating material desirable properties and type. Geosynthetics and its applications .Lintels –Arches – Stairs- different types and its components. Doors, Windows and Ventilations - Classification - Technical terms-Classification and Types

UNIT III ROOF 9 Hrs

Types of roofs – wooden trusses .Finishing works - Plastering, pointing, painting, white washing, colour washing, distempering; Damp proofing ant termite treatment.

UNIT IV CLIMATE AND COMFORT 9 Hrs

Global climatic factors – Elements of climates –Classification of tropical climates- site climate .The desirable conditions- Thermal comfort factors-Thermal comfort indices – Effective temperature

UNIT V THERMAL CONTROL 9 Hrs

Means of thermal control – Mechanical control- structural control- ventilation and air movement

Total No of Hrs: 45

REFERENCES:

1. *Gurucharan Singh, Building materials,,1996*
2. *Rangwala S. C, Engineering Materials, Charotar Publishing House, 1992, Anand*
3. *Punmia B. C, Building Construction, Laxmi Publlications, 1999, New Delhi.*
4. *Rangwala S. C, Building Construction, Charotar Publishing House, 1992, Anand*
5. *Huntington W.C, Building Construction, John Wiley, 1959, New York.*
6. *Koenigsberger,Manual of Tropical Housing and Building, Orient Longman Ltd*

Subject Code:	Subject Name ARCHITECTURE AND TOWN PLANNING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E04	Prerequisite: NONE	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
To impart knowledge on architectural design of structures as per the zoning regulations

COURSE OUTCOMES (COs) : (3- 5)
After successful completion of this course, the students should be able to

CO1	Understanding architectural design of structures
CO2	Applying the concept of land requirement as per the zoning regulations
CO3	Analyze and Practice Landscape design
CO4	Manipulate Surveys and analysis of a town
CO5	To create comprehensive knowledge on the design of Town Planning

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	2	2	2	3	3
CO2	3	3	3	3	2	3	3	2	2	2	3	3
CO3	3	3	3	3	2	3	3	2	2	2	3	3
CO4	3	3	3	3	2	3	3	2	2	2	3	3
CO5	3	3	3	3	2	3	3	2	2	2	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code:	Subject Name ARCHITECTURE AND TOWN PLANNING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E04	Prerequisite: NONE	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I ARCHITECTURAL DEVELOPMENT 9 Hrs

Natural and built environment, historic examples, factors influence architectural development.

UNIT II PRINCIPLES OF ARCHITECTURAL DESIGN 9 Hrs

Design methods, primary elements, form, space, organization, circulation, proportion and scale, ordering principles

UNIT III FUNCTIONAL PLANNING OF BUILDINGS 9 Hrs

Planning, designing and construction, general building requirements, permit and inspection (as per the National building Code)

UNIT IV EVOLUTION OF TOWNS 9 Hrs

History and trends in town planning: origin and growth, historical development of town planning in ancient valley civilizations; Objects and necessary of town planning; Surveys and analysis of a town; New Concepts in town planning: Garden city movement, Linear city and Satellite city concepts, Neighborhood Planning

UNIT V PLANNING PRINCIPLES, PRACTICE AND TECHNIQUES 9 Hrs

Elements of City plan, Estimating future needs, Planning standards, Zoning - its definition, procedure and districts, height and bulk zoning, F. A. R., Master Plan; Concepts of Urban planning, Design and Landscaping.

Total No of Hrs: 45

TEXT BOOKS

1. B. Gallion and S. Eisner, The Urban Pattern: City planning and Design - C B S publishers, 5th edition, 2005.
2. D. K. Francis Ching, Architectures: Form, Space and Order, John Wiley, 2nd edition 1996.

REFERENCES

1. *National Building Code of India 2005, BIS, New Delhi.*
2. *S. Eisner, A. B. Gallion and S. Eisner, The Urban Pattern: City planning and Design, John Wiley 6th edition 1996.*

PROGRAM ELECTIVE – II

Subject Code:	Subject Name: HYDROLOGY	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E05	Prerequisite: None	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To get exposure in the field of hydrology; To know the basic concepts in hydrology. To study the features of precipitation, evaporation and infiltration; To learn basics, estimation, and modeling of runoff;. To understand estimation, forecasting and control of flood; To familiarize computer applications in hydrology

COURSE OUTCOMES (COs) : (3- 5)

CO1	The students will gain knowledge on hydrologic cycle, hydrometeorology and formation of precipitation
CO2	The students will be able to apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing
CO3	Analyze and manipulate the hydrological measurements
CO4	Determine the meteorological related data
CO5	Create comprehensive knowledge on concepts of groundwater and hydraulics of subsurface flows

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	1	1	1	3	3
CO2	3	3	3	3	3	3	3	1	1	1	3	3
CO3	3	3	3	3	3	3	3	1	1	1	3	3
CO4	3	3	3	3	3	3	3	1	1	1	3	3
CO5	3	3	3	3	3	3	3	1	1	1	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code:	Subject Name: HYDROLOGY	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E05	Prerequisite: None	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

UNIT I INTRODUCTION 9 Hrs

Definition & Scope- Practical applications-Hydrological cycle – Transitory systems- formation, Types and forms of precipitation – Winds and their movement–Climate & weather season in India-Catchment area

UNIT II PRECIPITATION 9 Hrs

Measurement of Precipitation-Recording & Non- Recording Rain Gauges-Intensity duration Analysis-Intensity frequency duration Analysis- Average depth of precipitation over an areas-Depth area duration analysis-Rain gauge network.

UNIT III EVAPORATION & INFILTRATION 9 Hrs

Introduction- Evaporation process- Factors affecting Evaporation- Evaporation Estimation-Evaporation measurement- Evapo transpiration- Factors affecting infiltration-measurement of infiltration- Infiltration Equations

UNIT IV STREAM FLOW MEASUREMENT & HYDROGRAPH ANALYSIS 9 Hrs

Introduction-Measurement of stage-discharge measurement –area velocity method (Current meter method)-moving boat method- Stage discharge relationships – Flow measurements – Features of hydrograph- base flow-Hydrograph separation

UNIT V GROUND WATER HYDROLOGY 9 Hrs

Occurrence of ground water – Types of aquifer – Dupuit's assumptions – Darcy's law – Estimation of aquifer parameters – Pump tests.

Total No. of Hrs: 45

REFERENCES

1. *Jeya Rami Reddy.P,Hydrology, Laximi Publications, New Delhi, 2004.*
2. *Subramanya K.,Hydrology,Tata McGraw Hill Co., New Delhi, 1994*
3. *Patra.K.C, Hydrology and Water Resources Engineering, Narosa Publications, 2008, 2 nd Edition, New Delhi.*
4. *Chow V.T., Maidment D.R., Mays L.W., "Applied Hydrology,McGraw Hill Publications, NewYork, 1995*

Subject Code:	Subject Name: ENVIRONMENTAL IMPACT ASSESSMENT	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E06	Prerequisite: None	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

To know the objectives, capability, and limitations of environmental impact assessment.

To learn methodologies and legal aspects of environmental impact assessment;

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand and carry out scoping and screening of developmental projects for environmental and social assessments
CO2	Explain different methodologies for environmental impact prediction and assessment
CO3	Analyze environmental impact assessments and environmental management plans
CO4	Evaluate the design methods of EIA
CO5	Provide new methods and concepts in EIA

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	1	1	1	3	3
CO2	3	3	3	3	3	3	3	1	1	1	3	3
CO3	3	3	3	3	3	3	3	1	1	1	3	3
CO4	3	3	3	3	3	3	3	1	1	1	3	3
CO5	3	3	3	3	3	3	3	1	1	1	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code:	Subject Name: ENVIRONMENTAL IMPACT ASSESSMENT	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E06	Prerequisite: None	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

UNIT I INTRODUCTION 9 Hrs

Impact of development on environment and Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) – Objectives – Historical development – EIA capability and limitations – Legal provisions on EIA.

UNIT II METHODOLOGIES 9 Hrs

Methods of EIA – Strengths, weaknesses and applicability – Appropriate methodology – Case studies.

UNIT III PREDICTION AND ASSESSMENT 9 Hrs

Socio Economic Impact – Assessment of Impact on land, water and air, energy impact; Impact on flora and fauna; Mathematical models; public participation – Reports – Exchange of Information – Post Audit – Rapid EIA.

UNIT IV MATHEMATICAL MODELS FOR ASSESSMENT 9 Hrs

Use the mathematical models in EIA – Water quality, air quality and noise; assumptions and limitations.

UNIT V ENVIRONMENTAL MANAGEMENT PLAN 9 Hrs

Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, flora and fauna, addressing the issues related to the project affected people.

Total No. of Hrs:45

TEXT BOOKS

1. Canter, R.L. Environmental Impact Assessment, McGraw Hill Inc., New Delhi, 1996.
2. S.K.Shukla and P.R.Srivastava, Concepts in Environmental Impact Analysis, Common Wealth Publishers, New Delhi, 1992.

REFERENCES

1. *John G.Rau and David C Hooten (Ed)., Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1990.*
2. *Environmental Assessment Source book, Vol. I, II & III. The World Bank, Washington, D.C., 1991.*
3. *Judith Petts, Hand book of Environmental Impact Assessment Vol. I & II, Blackwell Science, 1999.*

Subject Code: EBCE22E07	Subject Name BRIDGE STRUCTURES	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Design of concrete structures	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To make the student to know about various bridge structures, selection of appropriate bridge structures and design it for given site conditions.

COURSE OUTCOMES (COs) : (3- 5)

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

CO1	Understand the basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
CO2	Identify the sizing of bridge elements ie., develop a clear understanding of conceptual design
CO3	Analyze the load flow mechanism and identify loads on bridges
CO4	Evaluate the design of bridges starting from conceptual design, selecting suitable bridge, geometry to sizing of its elements
CO5	To create modern Bridge elements and structures in Projects

Mapping of Course Outcomes with Program Outcomes (POs)

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code: EBCE22E07	Subject Name BRIDGE STRUCTURES	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Design of concrete structures	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION 9 Hrs

Design of through type steel highway bridges for IRC loading - Design of stringers, cross girders and main girders - Design of deck type steel highway bridges for IRC loading - Design of main girders.

UNIT II STEEL BRIDGES 9 Hrs

Design of pratt type truss girder highway bridges - Design of top chord, bottom chord, web members - Effect of repeated loading - Design of plate girder railway bridges for railway loading - Wind effects - Design of web and flange plates - Vertical and horizontal stiffeners.

UNIT III REINFORCED CONCRETE SLAB BRIDGES 9 Hrs

Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges - Design of panel and cantilever for IRC loading.

UNIT IV REINFORCED CONCRETE GIRDER BRIDGES 9 Hrs

Design of tee beam - Courbon's theory - Pigeaud's curves - Design of balanced cantilever bridges - Deck slab - Main girder - Design of cantilever - Design of articulation.

UNIT V PRESTRESSED CONCRETE BRIDGES 9 Hrs

Design of prestressed concrete bridges - Preliminary dimensions - Flexural and torsional parameters -Courbon's theory - Distribution coefficient by exact analysis - Design of girder section - Maximum and minimum prestressing forces - Eccentricity - Live load and dead load shear forces - cable zone in girder –Check for stresses at various sections - Check for diagonal tension - Diaphragms - End block - Short term and long term deflections.

Total No. of Hrs: 45

TEXT BOOKS

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 1990.
2. Ponnuswamy S., " Bridge Engineering ", Tata McGraw Hill, New Delhi, 1996.

REFERENCES

1. Phatak D.R., " Bridge Engineering ", Satya Prakashan, New Delhi, 1990.

Subject Code: EBCE22E08	Subject Name IRRIGATION ENGINEERING	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

The student also shall know the irrigation management practices of the past, present And future. The structures involved the elementary hydraulic design of different Structures and the concepts of maintenance shall also form part. Finally, the student shall be in a position to conceive and plan any type of irrigation project.

COURSE OUTCOMES (COs) : (3- 5)

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

CO1	To know the irrigation management practices of the past, present and future.
CO2	The knowledge on the structures involved in the elementary hydraulic design of different structures and the concepts of maintenance of irrigation structures
CO3	To conceive and plan any type of irrigation project

Mapping of Course Outcomes with Program Outcomes (POs)

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12
CO1	1	2	2	2	2	-	-	-	-	-	-	-
CO2	3	3	3	2	2	-	-	-	-	-	-	-
CO3	3	2	3	2	2	-	-	-	-	-	-	-

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code: EBCE22E08	Subject Name IRRIGATION ENGINEERING	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I : INTRODUCTION **9 Hrs**

Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – Crop and crop seasons – consumptive use of water – Duty – Factors affecting duty – Irrigation Efficiencies – Planning and Development of irrigation projects.

UNIT II: IRRIGATION METHODS **8 Hrs**

Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and Demerits – Sprinkler irrigation – Drip irrigation.

UNIT III : DIVERSION AND IMPOUNDING STRUCTURES **10 Hrs**

Weirs – elementary profile of a weir – weirs on pervious foundations - Types of Impounding structures - Tanks, Sluices and Weirs – Gravity dams – Earth dams – Arch Dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams.

UNIT IV : CANAL IRRIGATION **9 Hrs**

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works.

UNIT V: IRRIGATION WATER MANAGEMENT **9 Hrs**

Need for optimization of water use – Minimizing irrigation water losses – On farm Development works – Percolation ponds – Participatory irrigation management – Water Users associations – Changing paradigms in water management – Performance evaluation.

Total No of Hrs: 45

TEXT BOOKS

* Asawa, G.L., “Irrigation Engineering”, New Age International Publishers, New Delhi, 2000.
* Sharma, R.K., and Sharma, T.K., “Irrigation Engineering”, S.Chand and Company,New Delhi, 2000.

REFERENCES

* Basak, N.N., “Irrigation Engineering”, Tata McGraw-Hill Publishing Co., New Delhi, 2000.
* Garg, S.K., “Irrigation Engineering,” Laxmi Publications, New Delhi, 1999.
* Gupta, B.L., and Amir Gupta, “Irrigation Engineering”, SatyaPraheshan, New Delhi

PROGRAM ELECTIVE – III

Subject Code: EBCE22E09	Subject Name PRESTRESSED CONCRETE STRUCTURES	T / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Design of Concrete Structures	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Prestressing methods, principles and concepts are essential for the basic concept of the subject .
- Analysis of prestress and the resultant stresses using different concepts is dealt here;
- Determination of losses in concrete & Anchorage zone stresses in end block can be brought out using IS method

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student shall have a knowledge on methods of prestressing and composite construction
CO2	Recognize the effects of transfer and development length on flexural and shear strengths
CO3	Evaluate and analyze the stresses under various conditions
CO4	Calculate prestress losses for simple prestressed concrete girders
CO5	Student should be able to design various prestressed concrete structural elements

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code: EBCE22E09	Subject Name PRESTRESSED CONCRETE STRUCTURES	T / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Design of Concrete Structures	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 9 Hrs

Basic concepts – Advantages – Materials required – Systems and methods of pre -stressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons .

UNIT II DEFLECTION 9 Hrs

Deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of pre-stress – Losses of prestress - types - losses due to elastic deformation of concrete - shrinkage of concrete - creep of concrete - friction - anchorage slip – Estimation of crack width

UNIT III DESIGN 9 Hrs

Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic concepts in selection of cross section for bending – stress distribution in end block, Design of anchorage zone reinforcement – Limit state design criteria.

UNIT IV CIRCULAR PRESTRESSING 9 Hrs

General features & Design of prestressed concrete tanks – Prestressed concrete Poles, Shapes, Features & Design- Prestressed concrete sleepers – Development – Types- Design, Static & dynamic loads

UNIT V COMPOSITE CONSTRUCTION 9 Hrs

Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members– General aspects – pretension pre-stressed bridge decks – Post tensioned pre-stressed bridge decks –Advantages over R.C.C bridges- Design Principles of post tensioned prestressed concrete slab bridge deck, T Beam slab bridge deck & Continuous two span beam deck

Total No of Hrs: 45

TEXT BOOKS

1. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi, 2011
2. S.Ramamrutham, Prestressed concrete, Dhanpatrai Publishing company,2014
3. Mallic S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH Publishing Co.Pvt. Ltd. 1997.
4. Rajagopalan.N, Prestressed Concrete, Alpha Science, 2002.

REFERENCES

1. *Ramaswamy G.S., Modern Prestressed Concrete Design, Arnold Heinimen, New Delhi, 1990*
2. *Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay 1995*

Subject Code:	Subject Name: HOUSING PLANNING AND DESIGN	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E10	Prerequisite: Building Drawing Practice	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

A house plan is a set of construction or working drawings that define all the construction specifications of a residential House A truly successful project is one where project goals are identifies early on and where the interdependencies of all building systems are coordinated concurrently from the planning and programming phase.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Understanding the Plan the buildings, as per the law and rules and regulations
CO2	Applying the concept of Housing Planning
CO3	Analyze the slum clearance project and prepare plan for plot map cost flow .
CO4	Evaluate the design methods for House Planning and design
CO5	To create and identify the new housing projects

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code:	Subject Name: HOUSING PLANNING AND DESIGN	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E10	Prerequisite: Building Drawing Practice	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

UNIT I INTRODUCTION TO HOUSING 9 Hrs

Definition of Basic Terms – House, Home, Household, Apartments - Objectives of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Local bodies' Bye-laws at Urban and Rural Level and Development Control Regulations, Institutions for Housing at National, State and Local levels.

UNITII HOUSING PROGRAMMES 9 Hrs

Basic Concepts – Contents and Standards for Housing Programmes - Sites and Services, Neighbourhood, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programme, Role of Public, Private and Non-Government Organisations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9 Hrs

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems).

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9 Hrs

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation.

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9 Hrs

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems).

Total No of Hrs: 45

TEXT BOOKS

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 1997.

REFERENCES

1. *Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 200.*
2. *UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 1994.*
3. *National Housing Policy, 1994, Government of India.*

Subject Code:	Subject Name **INDUSTRIAL WASTE MANAGEMENT**	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E11	Prerequisite: Environmental Engineering	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To impart knowledge on various environmental legislations

To understand the treatment of industrial wastes

To impart knowledge on the pollution potential of major industries and the methods of controlling the same

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Suggest the industrial waste disposal methods on land and water environment
CO2	Conduct waste audit in an industry and implement waste minimization techniques
CO3	Analyze and Practice the waste management concepts
CO4	Evaluate the methods for various aspects in waste management
CO5	Identify the impacts on environment due to various industrial effluents

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	1	1	1	3	3
CO2	3	3	3	3	3	3	3	1	1	1	3	3
CO3	3	3	3	3	3	3	3	1	1	1	3	3
CO4	3	3	3	3	3	3	3	1	1	1	3	3
CO5	3	3	3	3	3	3	3	1	1	1	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code:	Subject Name **INDUSTRIAL WASTE MANAGEMENT**	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E11	Prerequisite: Environmental Engineering	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION 9 Hrs

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Hazardous Wastes – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes – Pollution Control Boards.

UNIT II CLEANER PRODUCTION 9 Hrs

Waste management Approach – Waste Audit – Volume and strength reduction – material and process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT III TREATMENT OF INDUSTRIAL WASTEWATER 9 Hrs

Equalisation – Neutralisation – removal of suspended and dissolved organic solids - Chemical oxidation – Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management.

UNIT IV TREATMENT AND DISPOSAL OF HAZARDOUS WASTES 9 Hrs

Physio chemical treatment – solidification – incineration – Secured landfills – Legal Provisions.

UNIT V CASE STUDIES 9 Hrs

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants.

Total No. of Hrs: 45

TEXT BOOKS

1. M.N.Rao & A.K.Dutta, Wastewater Treatment, Oxford IBH Publication, 1995.
2. W .W. Eckenfelder Jr., Industrial Water Pollution Control, McGraw-Hill Book Company, New Delhi, 1994.

REFERENCES

1. *T.T.Shen, Industrial Pollution Prevention, Springer, 1999.*
2. *R.L.Stephenson and J.B.Blackburn, Jr., Industrial Wastewater Systems Hand book, Lewis Publisher, New York,*
3. *H.M.Freeman, Industrial Pollution Prevention Hand Book, McGraw Hill Inc., New Delhi, 1995.*

Subject Code: EBCE22E12	Subject Name **COST EFFECTIVE BUILDINGS**	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete and Construction Technology	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The goal of low-cost housing is to save money while also maintaining buildings quality without sacrificing the strength, performance and life of the structure.

COURSE OUTCOMES (COs) : (3- 5)
After successful completion of this course, the students should be able to

CO1	Understanding the cost effective techniques and environmental friendly materials in construction
CO2	Apply and Identify the effects of global warming in construction
CO3	Analyze and Practice the design of green building concepts and its benefits in construction field
CO4	Evaluate the design methods for green buildings
CO5	To create comprehensive knowledge on the design of green buildings using modern technology

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	1	1	1	3	3
CO2	3	3	3	3	3	3	3	1	1	1	3	3
CO3	3	3	3	3	3	3	3	1	1	1	3	3
CO4	3	3	3	3	3	3	3	1	1	1	3	3
CO5	3	3	3	3	3	3	3	1	1	1	3	3

COs /	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code: EBCE22E12	Subject Name **COST EFFECTIVE BUILDINGS**	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete and Construction Technology	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION TO COST EFFECTIVE CONSTRUCTION 12HRS

Introduction to the concept of cost effective construction -Uses of different types of materials and their availability -Stone and Laterite blocks- Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- Lime-Poszolana Cement- Gypsum Board- Light Weight Beams- Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite- Bamboo- Availability of different materials-Recycling of building materials – Brick- Concrete- Steel- Plastics - Environmental issues related to quarrying of building materials.

UNIT II TECHNOLOGIES & METHODS IN CONSTRUCTION 12 HRS

Environment friendly and cost effective Building Technologies - Different substitute for wall construction Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials - Wall and Roof Panels – Beams – columns - Door and Window frames - Water tanks - Septic Tanks - Alternate roofing systems - Filler Slab - Composite Beam and Panel Roof -Pre-engineered and ready to use building elements - wood products - steel and plastic - Contributions of agencies

UNIT III GLOBAL WARMING & THE RELEVANCE OF GREEN BUILDINGS 7 HRS

Global Warming – Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions - Green Buildings – Definition - Features-Necessity – Environmental benefit - Economical benefits- Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials- Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings.

UNIT IV GREEN BUILDING 7 HRS

Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings - Embodied Energy in Materials-Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings.

UNIT V GREEN DESIGN 7 HRS

Green Design – Definition - Principles of sustainable development in Building Design - Characteristics of Sustainable Buildings – Sustainably managed Materials - Integrated Lifecycle design of Materials and Structures (Concepts only)

Total No of Hours : 45

REFERENCES:

1. *K S Jagadeesh, B V Venkatta Rama Reddy & K S Nanjunda Rao ,Alternative Building Materials and Technologies , New Age International Publishers.*
2. *Asko Sarja ,Integrated Life Cycle Design of Structures , SPON Press.*
3. *D S Chauhan and S K Sreevasthava , Non conventional Energy Resources , New Age International Publishers.*
4. *Laurie Backer, Buildings How to Reduce Cost, Cost Ford.*

PROGRAM ELECTIVE IV

Subject Code: EBCE22E13	Subject Name: STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Structural Analysis	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To develop systematically from basic principles of structural dynamics the characteristic of dynamic behaviour of the structure, namely, response spectrum

To expose important aspects of various theories of cause of earthquake and measurement of its effects on the structure as loads

COURSE OUTCOMES (COs) : (3- 5)

At the end of the course, student will be able to

CO1	Understanding of the behavior of EQ resistant structures
CO2	Applying the knowledge to analyze structures subjected to dynamic loading
CO3	The knowledge to design the structures for seismic loading as per code provisions
CO4	Evaluate the design methods for EQ resistant structures
CO5	Identify, formulate and solve free and forced vibrations response of structural systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code: EBCE22E13	Subject Name: STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Structural Analysis	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I SINGLE DEGREE OF FREEDOM SYSTEMS 9 Hrs

Formulation of equation of motion-free and forced vibrations-response to dynamic Loading-effect of damping

UNIT II MODAL ANALYSIS 9 Hrs

Free and forced vibration of un-damped and damped MDOF systems- equation of Motions- evaluation of natural frequencies and modes

UNIT III INTRODUCTION TO EARTH QUAKE ENGINEERING 9 Hrs

Elements of engineering seismology- characteristics of earth quake engineering- earth quake history- Indian seismicity.

UNIT IV BEHAVIOUR OF STRUCTURES AND SOIL 9 Hrs

Performance of structures under past earth quakes- lessons learnt from past earth Quakes- behavior of soil under earth quake loading- soil liquefaction- soil structure Interaction effects.

UNIT V EARTH QUAKE RESISTANT DESIGN 9 Hrs

Concept of Earth quake resistant design- provisions of seismic code IS-1893 (part I)- 2002- response spectrum- design spectrum- seismic coefficient- design of buildings.

Total No of Hrs: 45

TEXT BOOKS

1. Clough R. W, and Penzien J, Dynamics of structures, Second Edition, Mc Graw- Hill International edition,New Delhi, 1993
2. Mario Paz, structural dynamics- theory and computations, Third Editions CBS Publishers,New Delhi, 1990.

REFERENCES

1. *Minoru Wakabayashi, Design of earth quake resistant buildings,Mc Graw- Hill book company, New York 1986*
2. *Anil K Chopra, Dynamics Of Structures- Theory and applications to Earth quake engineering, Prentice hall inc, 2001*

Subject Code: EBCE22E14	Subject Name: DAM ENGINEERING	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Irrigation Engineering	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
To impart a knowledge on types of dam, its functions and design principles.

COURSE OUTCOMES (COs) : (3- 5)
At the end of the course, the student will be able to:

CO1	Thorough knowledge on Dam structures
CO2	Applying the concept for design of earth dams, gravity dams and rock fill dams
CO3	Analyse spillways and energy dissipation structures
CO4	Calculate the load factors for Dam Structures
CO5	To create comprehensive knowledge on the design of various types of Dams

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code:	Subject Name: DAM ENGINEERING	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E14	Prerequisite: Irrigation Engineering	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION 9 Hrs

Types of Dam, merits and demerits, dam site selection, selection of dam, Forces acting on gravity Dam, Methods of analysis of gravity Dam, Modes of failure and stability requirements, Design criteria and factor of safety.

UNIT II GRAVITY DAM 9 Hrs

Elementary profile of a gravity dam, Low and high gravity dams, Zoning of dams, Galleries in dams,Temperature control in mass concrete; gravity dams subjected to earthquakes.

UNIT III BUTTRESS AND ARCH DAMS 9 Hrs

Buttress and Arch dams, Types, selection, merits and demerits, Elementary design Principles of Arch and Buttress dams.

UNIT IV EARTH DAM 9 Hrs

Earth Dam their component and functions, causes of failure. Factors influencing the design of an earthdam. Design criteria for Earth Dam.

UNIT V SPILLWAY 9 Hrs

Elementary idea of design for spillway and energy dissipaters.

Total No of Hrs: 45

TEXT BOOKS

1. R.S. Varshney "Concrete Dams", by 1982, NCB, Roorkee
2. Design of Small Dams, USBR 1960, Calcutta, Oxford and IBH
3. W.P. Creager, J. Justin,.Daud Hinds, "Engineering for Dams" Vol. I-III, Wiley, N.Y., USA.
4. IS: 6512-1984, Criteria for Design of solid Gravity Dams.
5. IS:1893-1984, , Criteria for Earthquake resistant Design of structures.

REFERENCES

1. *NPTEL course materials from different IITs*

Subject Code:	Subject Name : INDUSTRIAL STRUCTURES	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E15	Prerequisite: Design of Concrete Structures, Design of Steel Structures	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

This course deals with some of the special aspects with respect to Civil Engineering structures in industries.

COURSE OUTCOMES (COs) : (3- 5)

At the end of this course the student shall be able to.

CO1	Discuss the planning and functional requirements of Industrial structures
CO2	Applying design concepts, and constructional aspects of Industrial structures
CO3	Analyze the importance of various construction materials for Industrial Construction
CO4	Evaluate the design of RC structures in Industry
CO5	Discover the modern technology used in Industrial Structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code:	Subject Name : INDUSTRIAL STRUCTURES	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E15	Prerequisite: Design of Concrete Structures, Design of Steel Structures	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I PLANNING 9 Hrs

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

UNIT II FUNCTIONAL REQUIREMENTS 9 Hrs

Lighting – Ventilation – Accounts – Fire safety – Guidelines from factories act.

UNIT III DESIGN OF STEEL STRUCTURES 9 Hrs

Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos

UNIT IV DESIGN OF R.C. STRUCTURES 9 Hrs

Silos and bunkers – Chimneys – Principles of folded plates and shell roofs

UNIT V PREFABRICATION 9 Hrs

Principles of prefabrication – Prestressed precast roof trusses- Functional requirements for Precast concrete units

Total No. of Hrs: 45

TEXT BOOKS

1. Reinforced Concrete Structural elements – P. Purushothaman
2. Pasala Dayaratnam – Design of Steel Structure - 1990

REFERENCES

1. *Henn W. Buildings for Industry, Vols. I and II, London Hill Books, 1995*
2. *Handbook on Functional Requirements of Industrial buildings, SP32 – 1986, Bureau of Indian Standards, New Delhi 1990*
3. *Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Structural Engineering Research Centre, Madras, 1982*

Subject Code:	Subject Name : ADVANCED ENVIRONMENTAL ENGINEERING	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E16	Prerequisite: Environmental Engineering	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
This course deals with some of the special concepts in Environmental Engineering

COURSE OUTCOMES (COs) : (3- 5)
At the end of this course the student shall be able to.

CO1	Discuss the planning and functional requirements of Environmental structures
CO2	Applying design concepts, and constructional aspects of Environmental structures
CO3	Analyze the importance of various construction materials for Environmental structures Construction
CO4	Evaluate the design of Environmental structures
CO5	Discover the modern technology used in Environmental Structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	1	1	1	3	3
CO2	3	3	3	3	3	3	3	1	1	1	3	3
CO3	3	3	3	3	3	3	3	1	1	1	3	3
CO4	3	3	3	3	3	3	3	1	1	1	3	3
CO5	3	3	3	3	3	3	3	1	1	1	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code:	Subject Name : ADVANCED ENVIRONMENTAL ENGINEERING	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E16	Prerequisite: Environmental Engineering	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I URBANISATION & POLLUTION **9 Hrs**

Consequences of urbanization, demand of resources by the public - Sources of Pollution to the urban environment: Status of pollution levels in major cities- Slum formation: Impact of slum on general quality of life on Urban elite – status of slum settlements in major cities.

UNIT II AIR & NOISE POLLUTION IN URBAN ENVIRONMENT **9 Hrs**

Air Pollution Sources: Nature of air pollution in the Urban environment due to human activities of industrialization, effect of air pollution on Urban Environment. Air pollution Indices for Assessment of status of Urban air quality. - Sources of noise pollution in Urban areas, effect ofnoise pollution on Urban environment, status of noise pollution in major cities.

UNIT III WATER AND LAND POLLUTION IN URBAN ENVIRONMENT **9 Hrs**

Water Demands and Pollution in Urban areas: Nature of water pollutants and assimilative capacity of natural Urban aquatic systems. Urban water quality indices – Sources of land pollution in urban areas: Impact of urban soil pollution on quality of living system – prediction of soil pollution indices.

UNIT IV MANAGEMENT OF URBAN ENVIRONMENT QUALITY **9 Hrs**

Land use planning – traffic management. Safe municipal water supply and planning of safe municipal water supply and drainage system – solid waste management including disposal – abatement of noise pollution – Provision of zones – regulation of settlements.

UNIT V CONSERVATION AND DISASTER MANAGEMENT **9 Hrs**

Natural Conservation: Planning of urbanization on ecological basis, preservation and development of green recovery areas. - Urban Disaster Management: Management of Industrial explosions, landslides, earthquakes, Floods and Management of epidemics.

Total No. of Hrs: 45

REFERENCES

1. Varshney, C.K., "Water Pollution and Management", Wiley Eastern Ltd., New Delhi, 1998.

2. Plowden, S., "The Cost of Noise", London, Metra, 1996.

3. Fallion, A.B. & E. Simon, "The Urban Pattern", Van Nistrand, New York.

4. M.J. Suess& S.R. Craxford, "Manual on Urban Air Quality", WHO, Copenhagen.

PROGRAM ELECTIVE V

Subject Code:	Subject Name REPAIR AND REHABILITATION OF STRUCTURES	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E17	Prerequisite: Concrete and Construction Technology	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

To make the students to gain the knowledge on quality of concrete, durability aspects, causes of deterioration.

To make the students to gain the knowledge on assessment of distressed structures, repairing of structures and demolition procedures.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Suggest maintenance and repair strategies
CO2	Assess the durability of concrete under various climatic conditions
CO3	Analyze the suitable materials for repair, rehabilitation and retrofitting techniques
CO4	Evaluate the design methods for repair, rehabilitation and retrofitting techniques
CO5	Apply repair, rehabilitation and retrofitting techniques for field projects

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code:	Subject Name REPAIR AND REHABILITATION OF STRUCTURES	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCE22E17	Prerequisite: Concrete and Construction Technology	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

UNIT I MAINTENANCE AND REPAIR STRATEGIES 9 Hrs

Maintenance- Repair and Rehabilitation. Facts of Maintenance - Importance of Maintenance- Various aspects of Inspection- Assessment procedure for evaluating a damaged structure, Causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE 9 Hrs

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness.

UNIT III SPECIAL CONCRETES 9 Hrs

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength and High-performance concrete, Vacuum concrete, Self-compacting concrete, Whisper concrete Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS 9 Hrs

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, Cathodic protection.

UNIT V RETROFITTING AND DEMOLITION TECHNIQUES 9 Hrs

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – Engineered demolition methods - Case studies.

Total No of Hrs: 45

TEXTBOOKS:

1. Shetty M.S., "Concrete Technology - Theory and Practice", S. Chand and Company, 2008.
2. Gambhir. M.L., "Concrete Technology", McGraw Hill, 2013
3. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.

REFERENCES:

1. *Ravi Shankar. K. Krishnamoorthy. T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.*
2. *Dov Kominetzky. M.S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001*
3. *CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.*
4. *Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987*

Subject Code: EBCE22E18	Subject Name MUNICIPAL SOLID WASTE MANAGEMENT	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Environmental Engineering	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

The student is expected to know about the various effects and legislations for the municipal solid waste.
To understand the various sources, characterization, processing and the disposal methods of municipal solid wastes.

COURSE OUTCOMES (COs) : (3- 5)

After completion of the course, student will be able to:

CO1	Understand the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management
CO2	Applying waste minimization plan and design storage, collection, transport, processing and disposal of municipal solid waste
CO3	Assess the management concepts in MSW
CO4	Determine the Processing techniques and Equipment in MSW management
CO5	Create, identify and design waste containment systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	1	1	1	3	3
CO2	3	3	3	3	3	3	3	1	1	1	3	3
CO3	3	3	3	3	3	3	3	1	1	1	3	3
CO4	3	3	3	3	3	3	3	1	1	1	3	3
CO5	3	3	3	3	3	3	3	1	1	1	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code: EBCE22E18	Subject Name MUNICIPAL SOLID WASTE MANAGEMENT	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Environmental Engineering	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I SOURCES AND TYPES 9 Hrs

Sources and types of solid wastes in a Municipality; Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization; Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs; Legislation.

UNIT II ON-SITE STORAGE & PROCESSING 9 Hrs

On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

UNIT III COLLECTION AND TRANSFER 9 Hrs

Methods of Collection – types of vehicles – Manpower – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions.

UNIT IV OFF-SITE PROCESSING 9 Hrs

Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, options under Indian conditions.

UNIT V DISPOSAL 9 Hrs

Dumping of solid waste; sanitary landfills – site selection, design and operation of sanitary landfills.

Total No. of Hrs: 45

TEXT BOOKS

1. George Techobanoglous et.al., Integrated Solid Waste Management, McGraw Hill Publishers, 1993.
2. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, Waste Management, Springer, 1994.

REFERENCES

1. *Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 200*
2. *R.E.Landreth and P.A.Rebers, Municipal Solid Wastes – problems and Solutions, Lewis Publishers, 1997*
3. *Bhide A.D. and Sundaresan, B.B., Solid Waste Management in Developing Countries; INSDOC, 1993.*

Subject Code: EBCE22E19	Subject Name FINITE ELEMENT ANALYSIS	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Structural analysis	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

The objective is to equip students with fundamentals of finite element principles so as to enable them to understand the behaviour of various finite elements and to be able to select appropriate elements to solve physical and engineering problems with emphasis on structural and thermal engineering applications.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Students will be able to understand computer codes for any structural problems using FE techniques
CO2	Apply the concept of the differential equations and their relationship in the analysis of structures
CO3	Analyze the numerical methods by FEM concept
CO4	Evaluate the logic and methods used in FEM
CO5	To create comprehensive knowledge on FEM analysis

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code: EBCE22E19	Subject Name FINITE ELEMENT ANALYSIS	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Structural analysis	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

UNIT I INTRODUCTION – VARIATIONAL FORMULATION 8 Hrs

General filed problems in Engineering – Modelling – Discrete and Continuous models – Characteristics – Difficulties involved in solution – The relevance and place of the finite element method – Historical comments – Basic concept of FEM, Boundary and initial value problems – Gradient and divergence theorems – Functionals – Variational calculus – Variational formulation of VBPS. The method of weighted residuals – The Ritz method.

UNIT II FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS 8 Hrs

One dimensional second order equations – discretisation of domain into elements – Generalised coordinates approach – derivation of elements equations – assembly of elements equations – imposition of boundary conditions – solution of equations – Cholesky method – Post processing – Extension of the method to fourth order equations and their solutions – time dependant problems and their solutions – example from heat transfer, fluid flow and solid mechanics.

UNIT III FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS 9 Hrs

Second order equation involving a scalar-valued function – model equation – Variational formulation – Finite element formulation through generalised coordinates approach – Triangular elements and quadrilateral elements – convergence criteria for chosen models – Interpolation functions – Elements matrices and vectors – Assembly of element matrices –boundary conditions – solution techniques.

UNIT IV ISOARAMETRIC ELEMENTS AND FORMULATION 10 Hrs

Natural coordinates inn 1, 2 and 3 dimensions – use of area coordinates for triangular elements in - 2 dimensional problems – Isoparametric elements in 1,2 and 3 dimensional – Largrangean and serendipity elements – Formulations of elements equations in one and two dimensions - Numerical integration.

UNIT V APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSION 10 Hrs

Equations of elasticity – plane elasticity problems – axis symmetric problems in elasticity Bending of elastic plates –Time dependent problems in elasticity – Heat – transfer in two dimensions – incompressible fluid flow.

Total No. of Hrs: 45

TEXT BOOKS

1. J.N.Reddy, "An Introduction to Finite Element Method", McGraw-Hill Book Co., Intl. Edition, 1985.

REFERENCES

1. *Rienkiewics, "The finite element method, Basic formulation and linear problems", Vol.1, 4/e, McGraw-Hill,Book Co.*
2. *S.S.Rao, "The Finite Element Method in Engineering", Pergaman Press, 1989.*
3. *C.S.Desai and J.F.Abel, "Introduction to the Finite Element Method", Affiliated East West Press 1972*

Subject Code: EBCE22E20	Subject Name PREFABRICATED STRUCTURES	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To impart knowledge to students on modular construction, industrialised construction and design of prefabricated elements and construction methods.

COURSE OUTCOMES (COs) : (3- 5)

The student shall be able to

CO1	Students can understand the basics of prefabricated elements
CO2	Apply the construction methods in prefabricated elements
CO3	Assess the utilization of various code provisions regarding progressive collapse
CO4	Calculate the efficiency of prefabricated elements.
CO5	To Practice and create comprehensive knowledge on the design of prefabricated structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Subject Code: EBCE22E20	Subject Name PREFABRICATED STRUCTURES	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION 9 Hrs

Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS 9 Hrs

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls.

UNIT III DESIGN PRINCIPLES 9 Hrs

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV JOINT IN STRUCTURAL MEMBERS 9 Hrs

Joints for different structural connections – Dimensions and detailing – Design of expansion joints.

UNIT V DESIGN FOR ABNORMAL LOADS 9 Hrs

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

Total No. of Hrs: 45

TEXT BOOKS

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

REFERENCES

1. *Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.*
2. *Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.*

OPEN ELECTIVES OFFERED FROM CIVIL ENGINEERING

Subject Code: EBCE22OE1	Subject Name : WATER POLLUTION AND ITS MANAGEMENT	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
To learn the fundamental concepts in the field of water pollution and its management

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, Students will be able to

CO1	To study the various Effects of Water pollution
CO2	Apply the mitigation measures to control of Water Pollution
CO3	To Analyze various Water Pollution control Acts
CO4	Evaluate the role of regulatory bodies in framing laws against water pollution
CO5	Practicing new methods in water pollution management

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	1	1	1	3	3
CO2	3	3	3	3	3	3	3	1	1	1	3	3
CO3	3	3	3	3	3	3	3	1	1	1	3	3
CO4	3	3	3	3	3	3	3	1	1	1	3	3
CO5	3	3	3	3	3	3	3	1	1	1	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
						✓	✓					

Subject Code: EBCE22OE1	Subject Name : WATER POLLUTION AND ITS MANAGEMENT	TY / Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I SOURCES & CHARACTERISTICS OF WATER POLLUTION 9 Hrs

Water pollution-Sources & types of water pollution –Physical, chemical & biological –Effect of water pollution. Drinking water quality standards waste Water treatment –Primary, secondary, tertiary-water pollution prevention & control act – 1974.

UNIT II W ATER QUALITY & STANDARDS 9 Hrs

Quality of surface waters, Water quality in flowing waters, Water quality in impounded waters, Groundwater quality, Water quality standard Microbiological quality of drinking water, and Chemical quality of drinking water

UNIT III INDUSTRIAL ACTIVITY & MITIGATION MEASURES 9 Hrs

Role of water in different industries-Effluent discharge characteristics-Discharge Standards for Rivers and Streams-Role of stakeholders, Public NGOS, Government in Protection of Water bodies-Control Measures-Mitigation Measures for Industrial Water Contamination due to industries.

UNIT IV WATER POLLUTION REGULATIONS 9 Hrs

Administrative regulation under recent legislations in water pollution control. Water (Prevention & control of pollution) Act 1974 as amended by Amendment Act 1988. Water (Prevention & control of pollution) Rules 1975 Water (Prevention & control of pollution) Cess Act. 1977 as amended by Amendment Act 1991.

UNIT V ROLE OF REGULATORY BOARDS 9 Hrs

Sustainable Development, Rain Water Harvesting-Methods-Water Pollution-Causes and Effects-Role of Regulatory bodies and Local bodies-CPCB-TWAD Board – CMWSSB etc-Case Studies related to Effective Water Management

Total No. of Hrs: 45

TEXT BOOKS

1. Fair.G.M, “Water and Waste water engineering Vol.I & II” .John Wiley and sons, Newyork. 2010.

REFERENCES

1. Metcalf & Eddy, “Wastewater engineering, Treatment and Reuse”, Tata MacGrawhill publications, 2008.
2. Eckenfelder, W.W., ""Industrial Water Pollution Control", McGraw-Hill, 2009.
3. Arceivala.S.J, "Wastewater Treatment for Pollution Control", Tata McGraw- Hill, 2008.
4. “Aruna Venkat Environmental Law and Policy”, PHI learning private limited New Delhi, 2011.
5. Water Management In India,”Concept Publishing Company”, New Delhi, 2004.

Subject Code: EBCE22OE2	Subject Name AIR POLLUTION AND CONTROL	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

To take up the basic concepts of air pollution.

The contents involved the knowledge of causes of air pollution

The contents involved the knowledge of health related to air pollution

COURSE OUTCOMES (COs) : (3- 5) On completion of the course the students would have

CO1	Understanding the behavior and Concepts of air pollution
CO2	Apply the principles to estimate the quantity of air pollutants
CO3	Analyze and develop control strategies
CO4	Calculate the amount of SO_4, CO in air by various methods
CO5	Create new technologies for Air Quality Monitoring

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	1	1	1	3	3
CO2	3	3	3	3	3	3	3	1	1	1	3	3
CO3	3	3	3	3	3	3	3	1	1	1	3	3
CO4	3	3	3	3	3	3	3	1	1	1	3	3
CO5	3	3	3	3	3	3	3	1	1	1	3	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
						✓	✓					

Subject Code: EBCE22OE2	Subject Name AIR POLLUTION AND CONTROL	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION 9 Hrs

History of Air pollution and episodes, Sources of air pollution and types,Introduction to meteorology and transport of air pollution: Global winds, Headley cells, wind rose terrestrial wind profile, Effects of terrain and topography on winds, lapse rate, maximum mixing depths, plume rise

UNIT II TRANSPORT OF POLLUTION IN ATMOSPHERE 9 Hrs

Plume behavior under different atmospheric conditions, Mathematical models of dispersion of air pollutants, Plume behavior in valley and terrains. Plume behavior under different meteorological conditions, Concept of isoplates

UNIT III EFFECTS OF AIR POLLUTION 9 Hrs

Effects of Air Pollution on human beings, plants and animals and Properties. Global Effects-Green house effect, Ozone depletion, heat island, dust storms, Automobile pollution sources and control, Photochemical smog, Future engines and fuels

UNIT IV AIR POLLUTION CONTROL 9 Hrs

Air Pollution control- at source-equipments for control of air pollution-For particulate matter-Settling chambers-Fabric filters-Scrubbers-Cyclones-Electrostatic precipitators, For Gaseous pollutants-control by absorption-adsorption-scrubbers-secondary combustion after burners, Working principles advantages and disadvantages, design criteria and examples.

UNIT V AIR QUALITY SAMPLING AND MONITORING 9 Hrs

Stack sampling, instrumentation and methods of analysis of SO2, CO etc, legislation for control of air pollution and automobile pollution

Total No. of Hrs: 45

References:

1. H.C Parkins, Air Pollution Mc Graw Hill Publication
2. H.S. Peavy, D.R. Row & G. Tchobanoglous, Environmental Engineering, Mc Graw Hill International Edition
3. Martin Crawford, Air Pollution Control Theory, TMH Publ.

Web Materials:

1. http://www.epa.gov
2. http://www.indiaenvironmentportal.org.in
3. http://nptel.iitm.ac.in
4. http://www.filtersource.com
5. https://dgserver.dgsnd.gov

Subject Code: EBCE22OE3	Subject Name GREEN BUILDING AND VASTU CONCEPTS	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

To expose the necessity of green building and acquire knowledge on vastu-shastra

COURSE OUTCOMES (COs) : (3- 5) On completion of the course the students would have

CO1	Students should be able to describe the importance and necessity of green building
CO2	Students should be able to assess a building norms for green building
CO3	Students should be able to analyze the materials and technologies to improve energy efficiency of building
CO4	Students should be able to determine the building norms in terms of vastu-shastra
CO5	To create comprehensive knowledge on the Green buildings with Vasthu concepts

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
						✓	✓					

Subject Code: EBCE22OE3	Subject Name GREEN BUILDING AND VASTU CONCEPTS	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION OF GREEN BUILDING 9 Hrs

Concept of green building, History of green building, Need of green building in present scenario, Importance of green building Merits and demerits, Classification of green building, Assessment methods Global assessment and certification, Local assessment, LEED India GRIHA (Green Rating for Integrated Habitat Assessment)

UNIT II PRINCIPLES AND ELEMENTS OF DESIGN OF GREEN BUILDING 9 Hrs

Sustainability: concept and reality 2. Climate responsive process of design: Climatic zones, design sequence, shelter or form, land form, vegetation, water bodies, street widths, open spaces, ground character, plan form, orientation, roof form 3. Shading devices and their effect

UNIT III THERMAL COMFORT INSIDE THE BUILDING 9 Hrs

Factors affecting, indices, cooling and heating requirement, Heat transmission through building sections, thermal performance of building sections, simple calculation for U value and insulation thickness . Day lighting. Ventilation

UNIT IV WATER CONSERVATION AND BUREAU OF ENERGY EFFICIENCY 9 Hrs

3 R's for water conservation, rain water harvesting, low flow fixtures, grey water recycling Material conservation: concept of embodied energy, low energy materials, sustainable materials, alternative materials Concept of carbon emission and its reduction Functions, policies, guidelines, Energy Conservation Building Code, Study of existing green buildingsIntroduction to Energy efficiency softwares, carbon calculators

UNIT V VASTU CONCEPT 9 Hrs

History, scientific approach, importance of shapes size and direction, vastu of a plot, elements of vastu for selecting a plot, vastu of a residence, vastu of existing building

Total No. of Hrs: 45

TEXT BOOKS

1. Climate responsive architecture (A design hand book for energy efficient buildings), Arvind Krishnana, Simos Yannas, Nick Baker, S V Szokolay, McGraw hill Education, Seventh reprint, 2013
2. Renewable Energy and Environment -A Policy Analysis for India, H, Ravindranath, K Usha Rao, B Nataraja n, P Monga, Tata McGraw Hill, 2000
3. Energy and the Environment, JM Fowler, McGraw Hill, New York, 2nd Edition, 1984

REFERENCE

1. *Handbook on functional requirements of buildings (SP41), BIS, New Delhi, 1987*
2. *Energy Conservation building code (ECBC), Bureau of energy efficiency, 2011*

Subject Code: EBCE22OE4	Subject Name CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

To understand the Earth's Climate System and the concept of Global Warming, the impact of climate change on society and its mitigation measures.

COURSE OUTCOMES (COs) : (3- 5)
At the end of the course the student will be able to

CO1	Understand the global climate change and its effects
CO2	Learn and Apply the concepts of climate change adaptation and various mitigation measures
CO3	Assess the concept of clean energy and energy conservation
CO4	Evaluate the climate change adaptation and various mitigation measures
CO5	Practice the mitigation process for Sustainable development

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
						✓	✓					

Subject Code: EBCE22OE4	Subject Name CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I EARTH'S CLIMATE SYSTEM 9 Hrs

Introduction-Climate in the spotlight –- Climate Classification - Global Wind Systems -Cloud Formation and Monsoon Rains – Storms and Hurricanes – The Hydrological Cycle – Global Ocean Circulation –Solar Radiation –The Earth's Natural Green House Effect – Green House Gases and Global Warming – Carbon Cycle.

UNIT II OBSERVED CHANGES AND ITS CAUSES 9 Hrs

Observation of Climate Change – Changes in patterns of temperature, precipitation and sea level rise – Observed effects of Climate Changes – Patterns of Large Scale Variability – Drivers of Climate Change – Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC .

UNIT III IMPACTS OF CLIMATE CHANGE 9 Hrs

Impacts of Climate Change on various sectors -Methods and Scenarios – Projected Impacts for Different Regions– Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

UNIT IV CLIMATE CHANGE ADAPTATION AND MITIGATION MEASURES 9 Hrs

Adaptation Strategy/Options in various sectors -Key Mitigation Technologies and Practices –Carbon sequestration – Carbon capture and storage (CCS)- Waste (MSW & Bio waste, Biomedical, Industrial waste – International and Regional cooperation.

UNIT V CLEAN TECHNOLOGY AND ENERGY 9 Hrs

Clean Development Mechanism –Carbon Trading examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power.

Total No. of Hrs: 45

REFERENCES

1. *Anil Markandya , Climate Change and Sustainable Development: Prospects for Developing Countries, Routledge, 2002*
2. *Heal, G. M., Interpreting Sustainability, in Sustainability: Dynamics and Uncertainty, Kluwer Academic Publ., 1998*
3. *Jepma, C.J., and Munasinghe, M., Climate Change Policy – Facts, Issues and Analysis, Cambridge University Press, 1998*
4. *Munasinghe, M., Sustainable Energy Development: Issues and Policy in Energy, Environment and Economy: Asian Perspective, Kleindorfor P. R. et. al (ed.), Edward Elgar, 1996*
5. *Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007.*

Subject Code: EBCE22OE5	Subject Name INTELLIGENT TRANSPORTATION SYSTEMS	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

To expose the recent advancements in Transport Systems

COURSE OUTCOMES (COs) : (3- 5) On completion of the course the students would have

CO1	Knowledge on the various principles and aspects of Intelligent Transport System
CO2	Understanding Transportation system and intersection management
CO3	Analyze the advanced transport system with route guidance
CO4	Manipulate the data for the Dynamic Traffic Assignment
CO5	To create comprehensive knowledge on the design of Intelligent transport system

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
						✓	✓					

Subject Code: EBCE22OE5	Subject Name INTELLIGENT TRANSPORTATION SYSTEMS	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION TO INTELLIGENT TRANSPORT SYSTEM 8 Hrs

Definition – Role and Responsibilities – Advanced Traveller Information System – Fleet Oriented ITS Services
– Electronic Toll Collection – Critical issues – Security - Safety 21

UNIT II ITS ARCHITECTURE AND HARDWARE 9 Hrs

Architecture – ITS Architecture Framework – Hardware Sensors – Vehicle Detection – Techniques – Dynamic Message Sign – GPRS – GPS – Toll Collection

UNIT III INTERSECTION MANAGEMENT 10 Hrs

Video Detection – Virtual Loop - Cameras - ANPR – IR Lighting – Integrated Traffic Management – Control Centre – Junction Management Strategies

UNIT IV ADVANCED TRANSPORT MANAGEMENT SYSTEM 10 Hrs

ATMS – Route Guidance – Issues - Travel Information – Pre Trip and Enroute Methods – Historical – Current – Predictive Guidance – Data Collection – Analysis – Dynamic Traffic Assignment (DTA) – Components – Algorithm

UNIT V ADVANCED TRAVELLER AND INFORMATION SYSTEM 8 Hrs

Basic ATIS Concepts – Smart Route System – Data Collection – Process – Dessemination to Travelers –Evaluation of Information – Value of Information – Business Opportunities

Total No. of Hrs: 45

REFERENCES

1. *Intelligent Transport Systems, Intelligent Transportation Primer, Washington, US, 2001*
2. *Henry F.Korth, and Abraham Siberschatz, Data Base System Concepts, McGraw Hill, 1992*
3. *E.Turban, ”Decision Support and Export Systems Management Support Systems", Maxwell Macmillan, 1998*
4. *Sitausu S.Mittra, "Decision Support Systems – Tools and Techniques", John Wiley, New York, 1986 5. Cycle W.Halsapple and Andrew B.Winston, "Decision Support Systems – Theory and Application¨, Springer Verlog, New York, 1987*

Subject Code: EBCE22OE6	Subject Name ENVIRONMENT, HEALTH AND SAFETY IN INDUSTRIES	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

To understand the basic needs of safety in human health, environmental safety, electrical safety, safety against accidents and fire
safety in various industries

COURSE OUTCOMES (COs) : (3- 5)

CO1	Learn the occupational safety and hygiene
CO2	Apply and practice the workplace safety and understand their responsibility
CO3	Possess an awareness on environment, health and safety in industries
CO4	Evaluate the frame work with data for inspections and audits
CO5	To create comprehensive knowledge on the Principles and methods of effective training in industries.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
						✓	✓					

Subject Code: EBCE22OE6	Subject Name ENVIRONMENT, HEALTH AND SAFETY IN INDUSTRIES	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I INTRODUCTION **9 Hrs**

Need for developing Environment, Health and Safety systems in work places, Status and relationship of Acts, Regulations and Codes of Practice, Role of trade union safety representatives .International initiatives, Ergonomics and work place.

UNIT II OCCUPATIONAL HEALTH AND HYGIENE **9 Hrs**

Definition of the term occupational health and hygiene, Categories of health hazards, Exposure pathways and human responses to hazardous and toxic substances, Advantages and limitations of environmental monitoring and occupational exposure limits, Hierarchy of control measures for occupational health risks, Role of personal protective equipment and the selection criteria.

UNIT III WORKPLACE SAFETY AND SAFETY SYSTEMS **9 Hrs**

Features of the satisfactory design of work premises HVAC, ventilation. Safe installation and use of electrical supplies, Fire safety and first aid provision, Significance of human factors in the establishment and effectiveness of safe systems, Safe systems of work for manual handling operations, Control methods to eliminate or reduce the risks arising from the use of work equipment, Requirements for the safe use of display screen equipment, Procedures and precautionary measures necessary when handling hazardous substances, Contingency arrangements for events of serious and imminent danger.

UNIT IV TECHNIQUES OF ENVIRONMENTAL SAFETY **9 Hrs**

Functions and techniques of risk assessment, inspections and audits, Investigation of accidents-Principles of quality management systems in health and safety management.

UNIT V EDUCATION AND TRAINING **9 Hrs**

Factors to be considered in the development of effective training programmes, Principles and methods of effective training, Feedback and evaluation mechanism.

Total No. of Hrs: 45

REFERENCES

1. *Environmental and Health and Safety Management by Nicholas P. Cheremisinoff and Madelyn L. Graffia, William Andrew Inc. NY, 1995*
2. *The Facility Manager's Guide to Environmental Health and Safety by Brian Gallant, Government Inst Publ. Effective Environmental, Health, and Safety Management Using the Team Approach by Bill Taylor, Culinary and Hospitality Industry Publications Services 2005*

Subject Code: EBCE22OE7	Subject Name INDUSTRIAL POLLUTION PREVENTION AND CLEANER PRODUCTION	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE:
Get educated on complete management principles related to the Cleaner Production and Control industrial Pollution

COURSE OUTCOMES (COs) : (3- 5) On completion of the course the students would have

CO1	Understand sustainable development and cleaner production concept
CO2	Apply the concept of cleaner Production for practical applications
CO3	Analyze, plan and implement cleaner production strategies
CO4	Evaluate the Process and equipment optimization, reuse, recovery, recycle, raw material substitution.
CO5	To create comprehensive knowledge on waste audit in industry and implement waste minimization techniques

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
						✓	✓					

Subject Code: EBCE22OE7	Subject Name INDUSTRIAL POLLUTION PREVENTION AND CLEANER PRODUCTION	TY / L/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I SUSTAINABLE DEVELOPMENT 9 Hrs

Sustainable Development-Indicators of Sustainability-Sustainability Strategies-Barriers to Sustainability-Industrial activity and Environment. Industrialization and sustainable development Industrial Ecology-Cleaner Production (CP) in Achieving Sustainability-Prevention versus Control of Industrial Pollution Environmental Policies and Legislations Regulations to Encourage Pollution Prevention and Cleaner Production-Regulatory versus Market Based Approaches

UNIT II POLLUTION PREVENTION 9 Hrs

Definition-Importance-Historical evolution Benefits-Promotion-Barriers-Role of Industry, Government and Institutions - Environmental Management Hierarchy Source Reduction Techniques-Process and equipment optimization, reuse, recovery, recycle Raw material substitution-Internet Information and Other CP Resources.

UNIT III CONCEPT OF CLEANER PRODUCTION 9 Hrs

Overview of CP Assessment Steps and skills, Preparing for the site visit, Information Gathering, and process flow diagram, material balance , CP Option Generation Technical and Environmental feasibility analysis-Economic valuation of alternatives-total cost analysis Financing- Establishing a program-Organizing a program-preparing a program plan- Measuring progress Pollution prevention and cleaner production Awarenessplan –Waste audit-Environmental Statement

UNIT IV LIFE CYCLE ASSESSMENT 9 Hrs

Elements of LCA-Life Cycle Costing Eco Labeling –Design for the Environment International Environmental Standards-ISO 14001- Environmental audit.

UNIT V CASE STUDIES 9 Hrs

Industrial application of CP, LCA, EMS Environmental Audits.

Total No. of Hrs: 45

TEXT BOOKS

1. Paul L Bishop, "Pollution Prevention Fundamental and Practice",McGraw-Hill International, 2009.
2. Prasad modak, C.Visvanathan and Mandarparasnis"Cleaner Production Audit", Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok, 2005.
3. S.P.Mahajan, "Pollution Control In Process Industries", McGraw-Hill International, 2005.

REFERENCES

1. *World Bank Group, "Pollution Prevention and Abatement Handbook-Towards Cleaner Production",World Bank and UNEP, Washington D.C, 2005.*
2. *Arceivala, S.J., "Wastewater Treatment for Pollution Control", Tata McGraw-Hill, 2008.*

Subject Code: EBCE22OE8	Subject Name FUNDAMENTALS OF NANOSCIENCE	TY / L/ ETL/I E	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE:

- Get educated on complete principles related to the science of nonmaterial's and preparation of Nanomaterials

COURSE OUTCOMES (COs) : (3- 5) On completion of the course the students would have

CO1	Understanding the science of nano materials
CO2	Applying the concept of nano materials to practical applications
CO3	Analyze ability to plan and implement nano materials in various construction applications
CO4	Evaluate the Process and application of Nano materials
CO5	To create comprehensive knowledge on applications of Nano materials

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	1	1	1	1	1	3
CO2	3	3	3	3	1	3	1	1	1	1	1	3
CO3	3	3	3	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	1	3	1	1	1	1	1	3
CO5	3	3	3	3	1	3	1	1	1	1	1	3

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
						✓	✓					

Subject Code: EBCE22OE8	Subject Name FUNDAMENTALS OF NANOSCIENCE	TY / L/ ETL/I E	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

OBJECTIVE:

To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION 8 Hrs

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowiresultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION 9 Hrs

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS 12 Hrs

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arcgrowth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applicationsNanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclaysfunctionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES 9 Hrs

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques,Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniquesAFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

UNIT V APPLICATIONS 7 Hrs

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

Total No. of Hrs: 45

TEXT BOOKS

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale Charecterisation of surfaces & Interfaces", 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES

1. G Timp, "Nanotechnology", AIP press/Springer, 1999.
2. Akhlesh Lakhtakia, "The Hand Book of Nano Technology, Nanometer Structure,

OPEN LABS OFFERED FROM CIVIL ENGINEERING

Subject Code: EBCE22OL1	Subject Name : BUILDING DRAWING PRACTICE USING AUTOCADD	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic Engineering Graphics	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Draw plan, section and elevation for various structures
CO2	Understand geometric construction and basic commands in Autocad
CO3	Prepare the building plans satisfying the principles of planning and byelaws.
CO4	Prepare detailed working drawings of doors, windows, roof trusses and staircases
CO5	Ability to manipulate drawings through editing and plotting techniques

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
						✓	✓		✓			

Subject Code: EBCE22OL1	Subject Name : BUILDING DRAWING PRACTICE USING AUTOCADD	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Basic Engineering Graphics	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

EXPERIMENTS

1. Learn and use basic AutoCAD commands - manage drawing using layers, colour and line types complete basic cad drawings, with borders, text and dimensions - use and edit text and text styles – Method of scales in various drawing - understand and the use of blocks.
2. Development of line plan for residential building. one for single storied building
3. Development of line plan for residential building. one for two storied building
4. Submission drawing for residential building including its planning and with area and parking statements and all other details as per the norms and local bye-laws.
5. Industrial buildings with roof truss.
6. To draw the 3D view of residential building.

Total No of Hrs: 45 hrs

TEXT BOOKS

1. Civil Engg. Drawing & House planning – B.P.Verma, Khanna publishers, Delhi,1990
2. Building drawing & detailing – Dr. Balagopal & T.S.Prabhu, Spades publishers, Calicut,1989.

REFERENCES

1. *Building drawing – Shah, Tata McGraw-Hill, New Delhi,2000.*
2. *Building planning & drawing – Dr. N.Kumaraswamy, A.Kameswara Rao, Charotar publishing house. Mumbai,1997.*
3. *Shah, Kale and Patki, Building drawing, Tata McGraw-Hill New Delhi,,1998.*

Subject Code: EBCE22OL2	Subject Name : GEOGRAPHICAL INFORMATION SYSTEM AND MAPPING LABORATORY	T y/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

The exercises are designed to give practical exposure to the students to data input, data storage
Data analyses and data output capabilities of a standard GIS software.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Explore mapped data
CO2	Relate GIS with remote sensing technologies
CO3	Analyze spatial data, using GIS analysis tools
CO4	Develop and manage geodatabases
CO5	Create maps, images and apps to communicate spatial data in a meaningful way to others

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
						✓	✓		✓			

Subject Code: EBCE22OL2	Subject Name : GEOGRAPHICAL INFORMATION SYSTEM AND MAPPING LABORATORY	T y/ Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

LIST OF EXERCISES

1. Digitization - Point, Line, Polygon and Surface Data
2. Building topology – measuring distance and area
3. Adding attribute data – querying on attribute data
4. Onscreen digitization - Data Conversion – Vector to Raster, Raster to Vector
5. Generation of DEM: from contours, spot heights
6. Vector Analysis – Buffering, Overlay and Network analysis
7. Data Output: Bar charts, Map compilation

Total No. of Hrs: 45

REFERENCES

1. *QGIS-1.8-UserGuide, http://docs.qgis.org/pdf/QGIS-1.8-UserGuide-en.pdf,2013*
2. *Getting to Know ArcGIS for Desktop,ISBN: 9781589483088 2013*
3. *Understanding GIS: An ArcGIS Project Workbook, ISBN: 9781589482425 2011*

Subject Code: EBCE22OL3	**Subject Name : ENVIRONMENTAL ENGINEERING LABORATORY**	**Ty/Lb/ ETL/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: None	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To impart knowledge on preparation of reagents, testing various water and waste water quality parameters

COURSE OUTCOMES (COs) : (3- 5)

CO1	Perform common environmental experiments relating to water and wastewater quality, and know which tests are appropriate for given environmental problems
CO2	Apply the laboratorial results to problem identification, quantification, and basic environmental design and technical solutions
CO3	Understand and use the water and wastewater sampling procedures and sample preservations
CO4	Obtain the necessary background for subsequent courses in environmental engineering
CO5	Demonstrate the ability to write clear technical laboratorial reports

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	3	3	3	3	3	2	2	2	2
CO2	3	3	2	3	3	3	3	3	2	2	2	2
CO3	3	3	2	3	3	3	3	3	2	2	2	2
CO4	3	3	2	3	3	3	3	3	2	2	2	2
CO5	3	3	2	3	3	3	3	3	2	2	2	2

COs / PSOs	**PSO1**	**PSO2**
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3
CO5	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
						✓	✓		✓			

Subject Code: EBCE22OL3	Subject Name : ENVIRONMENTAL ENGINEERING LABORATORY	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: None	Lb	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

LIST OF EXPERIMENTS

1. a) Determination of pH.

b) Determination of Turbidity.2. Determination of Hardness.

3. Determination of Alkalinity.
4. Determination of Residual Chlorine.
5. Estimation of Chlorides.
6. Estimation of Ammonia Nitrogen.
7. Estimation of Sulphate.
8. Determination of optimum coagulant dose.
9. Determination of specific conductivity.
10. Estimation of available chlorine in Bleaching Powder.
11. Determination of dissolved Oxygen.
12. Determination of suspended settleable, volatile and fixed solids
13. B.O.D. Test.
14. C.O.D. Test.

Total No of Hrs: 45

REFERENCE BOOKS

1. *Trivedi and Goel – Chemical and biological methods for water pollution studies. New Delhi,2000.*
2. *A course Manual – Water and wastewater analysis. National Environmental Engineering Research Institute. Nagpur – publication.*
3. *Standard Methods for Examination of water and Waste water APHa, AWWA and WPCF, 1985 Edition.*