Government College of Engineering, Karad

PROPOSED SCHEME OF INSTRUCTION

Programme: Double Minors (Multidisciplinary and Specialization Minors)

(Major: Semester – III)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEDO-0301	Basic Civil Engineering	02	--	02	02	50	50	100
		Total	**02**	**--**	**02**	**02**	**50**	**50**	**100**

(Major: Semester – IV)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAI
1	CEDO-0401	Building Materials	02	--	02	02	50	50	100
		Total	**02**	**--**	**02**	**02**	**50**	**50**	**100**

(Major: Semester – V)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAI
1	CEDO-0501	Building Planning and Drawing	03	--	03	03	50	50	100
2	CEDO -0502	Building Planning and Drawing Lab	--	02	02	01	50	-	50
		Total	**03**	**02**	**05**	**04**	**100**	**50**	**150**

(Major: Semester – VI)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAI
1	CEDO-0601	Building Services	02	--	02	02	50	50	100
		Total	**02**	**--**	**02**	**02**	**50**	**50**	**100**

(Major: Semester – VII)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAI
1	CEDO-0701	Smart Building I	02	--	02	02	50	50	100
		Total	**02**	**--**	**02**	**02**	**50**	**50**	**100**

(Major: Semester – VIII)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAI
1	CEDO -0801	Smart Building II	02	--	02	02	50	50	100
							PBE-I	**PBE-II**	
2	CEDO -0802	Major Capstone Project (Design & Development)	--	08	08	04	50	50	100
		Total	**--**	**08**	**10**	**06**	100	100	200

L- Lecture P-Practical

FA- Formative Assessment SA - Summative Assessment (For Laboratory End Semester performance)

PBE-I– Project-based Examination (For Laboratory Mid Semester Performance)

PBE- II Project-based Examination (For Laboratory End Semester Performance)

PROGRESSIVE TOTAL CREDITS: 18

Guidelines:- Students will take up 5-6 addittional courses in another Engineering/ Technology/ Emerging Area of Specialization of 18 credit distributed over semester III –VIII. These 18 credits will be over and above the 176 credits prescribed for four year multidisciplinary bachelor's degree in Engg/Tech Program.

DEPARTMENT OF CIVIL ENGG. Board of Studies Year 26-27 GCE KARAD

NOTE:

For students enrolled in **Internship mode**, the **examination evaluation for the above-mentioned subjects** will be conducted **online**. Additionally, **all associated academic activities** for these students will also be carried out **online.**

Government College of Engineering, Karad

Department of Civil Engineering

Programme: Double Minors (Multidisciplinary and Specialization Minors)

CEDO-0301: Basic Civil Engineering

Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		FA	50
Tutorials	00 Hrs/week		SA	50
Total Credits	02			

Prerequisite : Knowledge of identifying basic building components.

Course Outcomes (CO): Students will be able to

CO1	Understand role of Civil Engineer & applications of various branches of Civil Engineering.
CO2	Know various building components for construction.
CO3	Identify concepts of surveying & levelling and understand their applicability.
CO4	Understand types of infrastructure.

	Course Contents	**CO**	**Hours**
Unit 1	**Introduction to Civil Engineering:-** Role of Civil Engineer in various construction activities, Branches of Civil Engineering, Principles of planning, Selection of site for residential building, Important building bye-Laws, Typical plan of residential building with introduction to line plan.	CO1	(06)
Unit 2	**Building Components :** Sub-structure: Types of soil and rocks as foundation strata, Concept of bearing capacity, Types of foundations i.e. shallow & deep foundations, Plinth, Super-structure: Elements of super-structures: walls, floor, roof, doors & windows, lintel, staircase, etc.	CO2	(05)
Unit 3	**Types of structures:** Introduction to types of loads, Difference between load bearing and framed structures.	CO2	(04)
Unit 4	**Surveying**: Principles of surveying, Classification of surveys, Nominal scale and representative fraction. Ranging, offset, cross staff survey, compass survey & its types. **Levelling:** Introduction, Basic terminology, Types of Level, Levelling Staff.	CO3	(05)
Unit 5	**Introduction to Remote sensing and GIS**:- Geographical Information System (GIS), Global Positioning System (GPS) and its applications in Civil Engineering	CO3	(03)
Unit 6	**Introduction to Infrastructure:** Role of Infrastructure in Economic development, Types of Infrastructure.	CO4	(03)

Text Books

1.	S. P. Arora and S. P. Bindra, "A Text-Book of Building Construction", Dhanpat Rai Publication, ISBN 978-8189928803
2.	S. K. Duggal, "Building Materials", New Age Publishers, ISBN: 978-9387788398

Reference Books

1.	S. K. Sharma, "Civil Engineering Construction Materials", Khanna Book Publishing Co. Ltd., ISBN: 9789382609841.

Useful Links

1.	https://youtube.com/playlist?list=PLyqSpQzTE6M_RfjEQMK7_L-UvxAMhplUT
2.	https://youtube.com/playlist?list=PL8BA090E69BF01BC2
3.	https://youtube.com/playlist?list=PLk7ptZcI9vmhBh7evUtxAbHe3Ojs_099H

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO2
CO 1	-	-	-	-	-	-	-	1	2	1	2	1	2
CO 2	-	-	-	-	2	3	3	2	2	2	2	1	1
CO 3	3	-	-	2	3	3	3	2	2	3	2	2	2
CO 4	3	-	-	2	3	3	3	2	2	3	2	2	2

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	10	10
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	10	10
Create	-	-
TOTAL	50	50

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 26-27 CCE KARAD

Government College of Engineering, Karad

Department of Civil Engineering

Programme: Double Minors (Multidisciplinary and Specialization Minors)

CEDO-0401: Building Materials

Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		FA	50
Tutorials	00 Hrs/week		SA	50
Total Credits	02			

Prerequisite: Knowledge of identifying building materials

Course Outcomes (CO): Students will be able to

CO1	Understand the properties of construction materials.
CO2	Understand the specific use of construction materials.
CO3	Apply the knowledge for selection of materials on field.

	Course Contents	**CO**	**Hours**
Unit 1	**Stones:-** History of stones as a construction material, Quarrying of stones (methods only), Properties and uses of principle building stone, Requirement of good building stones, Types of building stones.	**CO1, CO2, CO3**	**(05)**
Unit 2	**Bricks:-** History of bricks as a construction material, Composition of clay bricks, Manufacturing of bricks, Types of bricks, Classification of burnt clay bricks, Fly ash bricks, Field tests for good brick ,Aerated cement concrete bricks.	**CO1, CO2, CO3**	**(04)**
Unit 3	**Timber:-** Structure of a timber tree, Properties of good Timber, Defects of timber, Decay of timber, Seasoning of timber, Preservation of timber.	**CO1, CO2, CO3**	**(04)**
Unit 4	**Cement and Mortar:-** Functions of mortar, Properties of an ideal motor, **Cement:-** Functions of cement ingredients, Composition of Portland cement, Types of cements.	**CO1, CO2, CO3**	**(04)**
Unit 5	**Aggregates and Tiles:-** Properties of fine aggregates and coarse segregates, Sand, artificial sand, Uses of sand. **Tiles:-** Properties of tiles, Use of tiles, Pavement blocks and their uses, Types of tiles.	**CO1, CO2, CO3**	**(05)**
Unit 6	**Miscellaneous Materials:-** Glass and its properties, Types of glass and uses, **Plastics:-** Properties of plastics and its uses, Use of aluminium in construction, Paints and its types.	**CO1, CO2, CO3**	**(05)**

Text Books

1. S. P. Arora and S. P. Bindra, "A Text-Book of Building Construction", Dhanpat Rai Publication, ISBN 978-8189928803
2. S. K. Duggal, "Building Materials", New Age Publishers, ISBN: 978-9387788398

Reference Books

1. S. K. Sharma, "Civil Engineering Construction Materials", Khanna Book Publishing Co. Ltd., ISBN: 9789382609841.

Useful Links

1. https://youtube.com/playlist?list=PLyqSpQzTE6M_RfjEQMK7_L-UvxAMhplUT
2. https://youtube.com/playlist?list=PL8BA090E69BF01BC2
3. https://youtube.com/playlist?list=PLk7ptZcI9vmhBh7evUtxAbHe3Ojs_099H

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	-	-	-	-	-	-	-	1	2	1	2	1	2
CO 2	-	-	-	-	2	3	3	3	2	2	2	2	1	1
CO 3	3	-	-	2	3	3	2	3	2	2	3	2	2	2

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	10	10
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	10	10
Create	-	-
TOTAL	50	50

Government College of Engineering, Karad

Department of Civil Engineering

Programme: Double Minors (Multidisciplinary and Specialization Minors)

CEDO-0501 : Building Planning and Design

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		FA	50
Tutorials	00 Hrs/week		SA	50
Total Credits	03			

Prerequisite : Basic Civil Engineering, Building Material

Course Outcomes (CO): Students will be able to

CO1	Knowledge about various building components and their application.
CO2	Draw the different building components and demonstrate requirements and suitability of those components.
CO3	Plan and design of buildings as well as its components as per SP-7 and National Building Code.
CO4	Learn the skills of drawing building sign convention, bonds, building elements and plan the buildings as per requirements.

	Course Contents	CO	Hours
Unit 1	**Building Components:** Foundations, plinth, walls and columns in superstructure, floors, doors and windows, sills, lintels, roofs, steps and stairs, utility fixtures.	**CO1 CO2**	**(07)**
Unit 2	**Building Components and Design :** Foundations: Types and their suitability. Stone masonry – Random Rubble, Un-coursed Rubble, Coursed Rubble and Ashlar Masonry. Brickwork and Brick Bonds – Types of brick bonds English and Flemish. Arches: Technical terms in arches, types of arches, methods of construction. Lintel: Classification, Doors and Windows: Classification, Stairs: Technical terms, types, Design of stairs, Roofs and floor: types and their suitability.	**CO1 CO2**	**(07)**
Unit 3	**Building Planning By Laws and Regulation :** Introduction, Terminology, Objectives of building byelaws, Floor Area Ratio (FAR) – Floor Space Index (FSI),Principles underlying building byelaws, classification of buildings, Open space requirements, built up area limitations, Height of Buildings – Wall thickness, lighting and ventilation requirement.	**CO3**	**(06)**
Unit 4	**Planning of Buildings (Residential and Public):** Site Selection criteria, Principles of Building planning. Significance Sun path diagram. Wind Diagram, Orientation, Factors affecting and criteria under Indian condition. Building Planning Byelaws and regulations as per SP-7.	**CO3**	**(07)**
Unit 5	**Sign Conventions and Bonds :** Sign Conventions- Plumbing System, Electrification System, Furniture system, Building materials and component, Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond- odd and even courses for one, one-half, two and two & half brick walls in thickness at the junction of a corner.	**CO4**	**(07)**
Unit 6	**Doors, Windows, Ventilators And Roofs:** Panelled door, panelled and glassed door, glassed windows, paneled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs. King Post truss, Queen Post truss Sloped and flat roof buildings: drawing plans, Elevations and Cross Sections of given sloped roof buildings.	**CO4**	**(06)**

Text Books

1. Building Design by Shah, Kale, Patki. Tata Mc-Graw Hill Publications. (Edition 2015)
2. Building Design by Bindra& Arora –S.Chand.(Edition 2008)
3. Building Construction and materials by Chowdhari Dhanpat Rai Publication. (Edition 2014)

Reference Books

1. National Building code SP-7. (Edition 2005)
2. Civil Engineering Materials - Technical Teacher's Training Institute, Chandigarh
3. Building construction By Rangawala
4. Building Construction by B.C Punmia, Ashok ku. Jain, Arun Kumar Jain.

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5.	Building materials and construction by SS Bhavikatti.

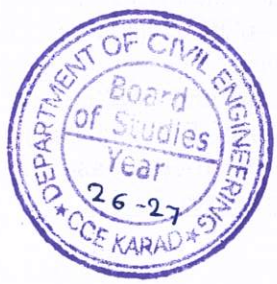
Useful Links			
1.	https://easyengineering.net/building-materials-duggal/		
2.	https://bharatskills.gov.in/Home/StudyMaterial?var=EDAGX24kJCO/9o2J0MaRDg==&Default=YES		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	2	-	2	-	-	-	-	-	-	-	-	2	2
CO 2	2	-	3	-	-	-	-	-	-	-	-	2	2
CO 3	2	-	3	-	1	-	-	-	1	-	-	2	2
CO 4	2	-	2	-	1	-	-	-	-	-	-	2	2

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	10	10
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	10	10
Create	-	-
TOTAL	50	50



Government College of Engineering, Karad				
Department of Civil Engineering				
Programme: Double Minors (Multidisciplinary and Specialization Minors)				
CEDO- 0502: Building Planning and Design Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week			
Total Credits	1		SA	50

Prerequisite : Basic Civil Engineering, Building Material

Course Outcomes (CO): Students will be able to

CO1	Draw various buildings as per the building by-laws and regulation.
CO2	Skills of drawing building elements and plan the buildings as per requirements.
CO3	Apply the knowledge of buildings planning in different building units.
CO4	Apply the building bye laws and principles of planning for residential and public buildings

Course Contents		CO
Experiment 1	Draw component parts of a single storied residential building with suitable symbols and scales.	CO1, CO2, CO4
Experiment 2	Draw different types of stone and brick masonry.	CO1, CO2
Experiment 3	Draw different types of shallow and deep foundation.	CO1, CO2
Experiment 4	Draw different types of doors and windows.	CO1, CO2
Experiment 5	Draw different types Staircase.	CO1, CO2
Experiment 6	Draw a line plan of residential building.	CO1, CO2,CO3,CO4
Experiment 7	Prepare the Drawing of Sign Conventions/Symbol for electrical wiring system.	CO3
Experiment 8	Prepare the Drawing of Sign Conventions/Symbol for Plumbing system.	CO3
Experiment 9	Drawing line plans of public buildings (select one building from of the following types): 1. Educational buildings 2. Office Buildings	CO1, CO2,CO3,CO4
Experiment 10	Drawing line plans of public buildings (select one building from of the following types): 1. Buildings for transportation 2. Assembly buildings	CO1, CO2,CO3,CO4

List of Submission:

1.	Minimum number of Experiments : 08

Text Books	
1.	Building Design by Shah, Kale, Patki. Tata Mc-Graw Hill Publications. (Edition 2015)
2.	Building Design by Bindra & Arora–S. Chand.(Edition 2008)
3.	Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers, NewDelhi
Reference Books	
1.	National Building Code 2016 (Volume- I & II).
2.	Times Saver standards of Architectural Design Data by Callender, Tata McGaw Hill.
3.	Development plan and DCP Rules of urban local body, New Delhi, Volume 12.
4.	Building Design and construction by Frederick Merrit, Tata McGraw Hill
5.	Model building bye laws by MoUD, GoI.
Useful Links	
1.	http://new.usgbc.org/
2.	http://www.grihaindia.org/

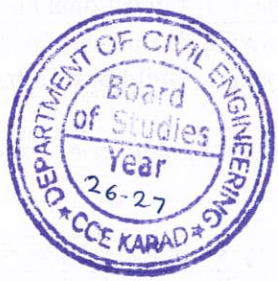
Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	2	-	2	-	1	-	-	-	-	2	2	2	2
CO2	2	-	2	-	1	-	-	-	-	1	1	2	1
CO3	2	-	2	-	1	-	-	-	-	1	1	2	1
CO4	2	-	2	-	1	-	-	-	-	2	2	2	2

1: Slight (Low) 2: Moderate(Medium) 3: Substantial(High)

Guidelines for Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	30	30	30	30	30	30	30	30	30	30	30
Task II	10	10	10	10	10	10	10	10	10	10	10
Task III	10	10	10	10	10	10	10	10	10	10	10
ISE	50	50	50	50	50	50	50	50	50	50	50



Government College of Engineering, Karad

Department of Civil Engineering

Programme: Double Minors (Multidisciplinary and Specialization Minors)

CEDO- 0601: Building Services

Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		FA	50
Tutorials	00 Hrs/week		SA	50
Total Credits	02			

Prerequisite : Basic Civil Engineering, Building Material and Building Planning and Design.

Course Outcomes (CO): Students will be able to

1.	Identify and draw various plumbing system components and electrical fitting components in buildings.
2.	Knowledge and their application of ventilation systems, thermal insulation and fire resistance system as per National Building Code (SP-7)
3.	Knowledge and their application of acoustics systems in buildings and sound insulation as per NBC (SP-7)
4.	Understand types of vertical circulation and paints in buildings and its suitability in public and residential building.

	Course Contents	**Hours**
Unit 1	**Plumbing and electrification in buildings** :Plumbing systems, material used for service pipes, valves- function and types, fitting and taps, sanitary fittings- water closet, flushing cistern, wash basin, sink, urinals, traps- types and requirements, rain water harvesting system. Concealed and open wiring, requirements and location of various points, accessories of electrical installation, concept of earthing.	**(05)**
Unit 2	**Ventilation:** - Definition and necessity of ventilation, functional requirement, various system and Selection criteria. Air conditioning: - purpose, classification, principles, systems and various components of the same.	**(04)**
Unit 3	**Fire protection in buildings:** Fire protection precautions, confining of fire, fire hazards, characteristics of fire resisting materials, building materials and their resistance to fire	**(04)**
Unit 4	**Acoustics and Sound Insulation in buildings:** Introduction to acoustics: Absorption of sound, various materials, conditions for good acoustics. Sound Insulation and methods of noise control.	**(04)**
Unit 5	**Thermal insulation and painting in buildings:** - General concept, materials, methods Paints: Different types and application methods.	**(05)**
Unit 6	**Vertical Circulation in the Building:** Stairs: Technical terms, requirements of a good stair, uses, types, ramps, lifts and escalator.	**(04)**

Text Books

1.	Building Design by Shah, Kale, Patki. Tata Mc-Graw Hill Publications. (Edition 2015)
2.	Building Construction by B.C. Punmia (Edition 2015)
3.	Building materials and construction by SS Bhavikatti.

Reference Books

1.	National Building code SP-7.(Edition 2016)
2.	Building Services Handbook by Fred Hall and Roger Greeno

Useful Links

1.	https://ocw.mit.edu/courses/architecture/4-401-introduction-to-building-technology-spring-2006/lecture-notes/

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 26-27 GCE KARAD

Mapping of COs and POs

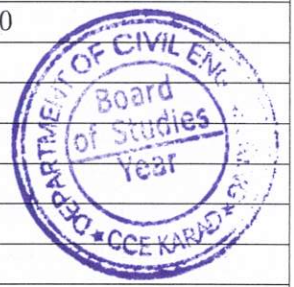
PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	-	-	-	-	1	1	-	-	-	-	2	2
CO 2	2	-	-	-	-	2	2	-	-	-	-	2	2
CO 3	2	-	-	-	-	2	2	-	-	-	-	2	2
CO 4	1	-	-	-	-	1	1	-	-	-	-	2	2

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	10	10
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	10	10
Create	-	-
TOTAL	50	50

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 26-27 CCE KARAD

Government College of Engineering, Karad				
Department of Civil Engineering				
Programme: Double Minors (Multidisciplinary and Specialization Minors)				
CEDO-0701: Smart Building - I				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		FA	50
Tutorials	00 Hrs/week		SA	50
Total Credits	02			



Prerequisite: Building Materials, Building Services

Course Outcomes (CO): Students will be able to

CO1	Describe key concepts and components of smart buildings.
CO2	Explain sustainable and energy-efficient building design practices.
CO3	Implement basic building services and automation systems.
CO4	Examine sensor-based systems used for monitoring building performance.

	Course Contents	CO	Hours
Unit 1	**Introduction to Smart Buildings** Overview of Traditional vs Smart Buildings, Main parts of a smart building: structure, envelope, services, digital layer, Role of different engineering branches in smart buildings, Examples of smart buildings in India and abroad, Concept of Net-zero and climate-responsive buildings.	**CO1**	**(05)**
Unit 2	**Basics of Sustainable & Energy-Efficient Buildings** Introduction to sustainability in buildings, Building envelope basics: insulation, glazing, shading, Passive features: daylighting and natural ventilation, Basic understanding of HVAC and indoor air quality, Introduction to rooftop solar power.	**CO2**	**(04)**
Unit 3	**Building Automation & Basic Building Services** What is a Building Automation System (BAS), Smart lighting: automatic and adaptive controls, Simple automated HVAC controls, Basic water supply automation (pumps, tank level control), Basics of fire detection and alarm systems, Basic security systems.	**CO3**	**(04)**
Unit 4	**Sensors & Monitoring in Smart Buildings** Common sensors: temperature, humidity, occupancy, smoke, CO_2, leakage, Smart meters for monitoring electricity and water, Basic idea of IoT and simple data collection, Practical uses: smart parking, leakage detection, air quality monitoring.	**CO3**	**(04)**
Unit 5	**Smart Building Design & User-Focused Features** Human comfort needs: thermal, visual, and acoustic comfort, Smart use of space: flexible layouts, smart classrooms, Basics of climate-responsive facades, Introduction to BIM for building planning and management.	**CO4**	**(04)**
Unit 6	**Building Performance & Facility Management** Key performance measures: energy, water use, comfort, reading simple dashboards and usage patterns, Difference between preventive and predictive maintenance, Case studies on energy saving and smart water management.	**CO4**	**(04)**

List of Submission: Assignments and case study

Text Books

1.	S. K. Jain and R. K. Jain, "Energy Management and Conservation" New Delhi, India: Khanna Publishers, 2017. (Unit 2 and 6)
2.	B. Sengupta, "Building Services and Equipment", New Delhi, India: Tata McGraw-Hill Education, 2014. (Unit 3)
3.	C. S. Rao and P. S. Rao, "Building Planning and Design", New Delhi, India: Pearson Education India, 2016. (Unit 1 and 5).
4.	J. Sinopoli, "Smart Building Systems for Architects, Owners and Builders", Oxford, UK: Butterworth-Heinemann (Elsevier), 2010. (Unit 1, 4 and 5)
5.	Jain, V. K. "Automation Systems in Smart and Green Buildings (Modern Building Technology)", Khanna Publishers, 1st Edition, 2009. (Unit 3 and 4)
6.	Majumdar, M. (Ed), Energy efficient Buildings in India, Tata Energy Research Institute, Ministry of Non-

	Conventional Energy Sources, 2002. (Unit 1,2 and 6)
Reference Books	
1.	Khazaii, Javad, "Energy-efficient HVAC design", Springer International Publishers, 2016. (Unit 2 and 6)
2.	Jadhav, N. Y. "Green and Smart Buildings", Springer Publishers, 2016. (Unit 1,2,3 and 6)
3.	C. C. Wang, "Smart Sensors and Sensing Technology", Boca Raton, FL, USA: CRC Press, 2014. (Unit 4)
4.	E. Eastman, P. Teicholz, R. Sacks, and K. Liston, "*BIM Handbook",* 2nd ed. Hoboken, NJ, USA: John Wiley & Sons, 2011. (Unit 5)
Useful Links	
1.	https://www.youtube.com/watch?v=4z3w9CwF2YI&t=1s, "The Energy-Efficient Buildings" by Prof. Vandana Chandrakar, Department of Urban Planning at UTD, CSVTU, Bhilai.
2.	https://www.youtube.com/watch?v=8AwTVpfgcE0, "Building Materials as a Cornerstone to Sustainability" by Prof. Iyer Vijayalaxmi Kasinath, School of Planning and Architecture, Vijayawada, An Institute of National Importance under the Ministry of Education, Govt. of India
3.	https://www.youtube.com/watch?v=sDfINQurIlE, "Sustainable Construction Materials and Techniques" by Dr.K.S.A. Dinesh Kumar Department of Civil and Environmental Engineering, National Institute of Technical Teachers Training and Research, Chennai.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	2	-	1	2	2	-	1	1	-	2	3	2
CO 2	3	3	2	-	2	3	2	-	-	1	2	3	2
CO 3	3	2	3	2	3	2	-	2	2	2	2	3	3
CO 4	3	3	2	3	3	3	1	-	2	1	2	3	3

Guideline for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	10	10
Understand	15	15
Apply	15	15
Analyze	10	10
Evaluate	-	-
Create	-	-
TOTAL	50	50

Government College of Engineering, Karad				
Department of Civil Engineering				
Programme: Double Minors (Multidisciplinary and Specialization Minors)				
CEDO-0801: Smart Building II				
Teaching Scheme			**Examination Scheme**	
Lectures	02Hrs/week		FA	50
Tutorials	00 Hrs/week		SA	50
Total Credits	02			

Prerequisite: Building Planning and Design, Building Construction Material, Advanced Construction Techniques

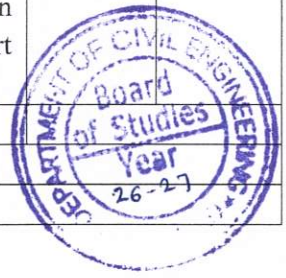
Course Outcomes (CO): Students will be able to

CO1	Understand the Definition, Significance, and History of Smart Buildings.
CO2	Apply Knowledge of Smart Materials in Smart Building Design.
CO3	Analyse and implement energy-efficient building envelope designs to minimise energy consumption and enhance building performance.
CO4	Examine Real-World Applications and Case Studies.

	Course Contents	CO	Hours
Unit 1	**Introduction to Smart Buildings** Definition and significance of smart buildings, History, importance and need, merits and demerits of smart building materials. Smart Structure system, Components, Importance of smart structures.	**CO1**	**(4)**
Unit 2	**Smart Building Material** Fundamentals of Smart Materials Types and characteristics of smart materials Property-changing materials- Thermo-chromic, Photochromic, Energy-exchanging materials Piezoelectric, Thermoelectric, Miscellaneous Materials: Shape Memory alloy, optical fiber, Construction chemicals, Sealants etc. Review of material, effect, working principle, advantages and disadvantages, application in Smart Structures, Use of alternative materials for structural steels and rebars.	**CO2**	**(5)**
Unit 3	**Connectivity and IoT in Smart Buildings.** Internet of Things (IoT) in the context of smart buildings, Wireless connectivity and network infrastructure, Interoperability and standardization in smart building systems, Data integration and management in IoT-enabled buildings, Cybersecurity and privacy considerations in connected buildings.	**CO3**	**(4)**
Unit 4	**Sustainable Design Principles in Smart Buildings.** Energy-efficient building envelope design, Passive design strategies for thermal comfort and day lighting, Water conservation and efficient resource management, Sustainable materials and life-cycle assessment in smart building design, Indoor environmental quality and occupant well-being in sustainable buildings.	**CO3**	**(5)**
Unit 5	**Case Studies and Real-world Applications** Examples of successful smart building projects, Innovative technologies and design approaches in practice, Lessons learned and best practices from real-world implementations, Economic and financial considerations for smart building investments, Social and environmental impacts of smart buildings.	**CO4**	**(5)**
Unit 6	**Challenges and Future Trends** Evolving technologies and their impact on smart building design, Regulatory and policy considerations for advancing smart buildings, Resilience and disaster preparedness in smart building design, Human-centred design and occupant engagement in smart buildings, Emerging trends in sustainable and intelligent building design.	**CO4**	**(5)**

Submission

Assignments, Case study



Text Books	
1.	Kibert, C. J., 'Sustainable Construction: Green Building Design and Delivery', John Wiley & Sons, USA. 4th Edition (Unit 1, 4, 5, 6)
2.	Sinopoli, J., 'Smart Building Systems for Architects, Owners and Builders', Butterworth-Heinemann (Elsevier), UK. 2nd Edition (Unit 1, 3, 5)
3.	Sinopoli, J., 'Advanced Technology for Smart Buildings', Artech House, Boston. 1st Edition (Unit 3, 5, 6)
4.	Jadhav, N. Y., 'Green and Smart Buildings: Advanced Technology Options', Springer Nature, Singapore. 1st Edition (Unit 2, 4, 5)
5.	Arora, S. P., Bindra, S. P., 'Building Construction: Materials and Techniques', Dhanpat Rai & Co., New Delhi. Revised Edition (Unit 1, 2)
6.	Duggal, S. K., 'Building Materials', New Age International Publishers, New Delhi. 4th Edition (Unit 2, 4)
7.	Jain, A. K., 'Smart Infrastructure and Sustainable Construction', PHI Learning Pvt. Ltd., New Delhi. 1st Edition (Unit 1, 3, 6)
Reference Books	
1.	Wadhawan, V. K., 'Smart Structures: Blurring the Distinction between the Living and the Nonliving', Oxford University Press, Oxford. 1st Edition
2.	Addington, D. M., Schodek, D. L., 'Smart Materials and New Technologies for Architecture and Design Professions', Architectural Press, Elsevier, UK. 1st Edition
3.	Reddy, B. V. V., Jagadish, K. S., 'Sustainable Building Technologies', Universities Press, Hyderabad, India. 1st Edition
4.	Sinopoli, J., 'Advanced Technology for Smart Buildings', Artech House, Boston. 1st Edition
5.	Kibert, C. J., 'Sustainable Construction: Green Building Design and Delivery', John Wiley & Sons, USA. 4th Edition
6.	O'Donnell, J. T., Maile, T., Rose, C., 'Model-based design and performance optimisation of smart buildings', *Energy and Buildings,* Elsevier
7.	Jain, A., Garg, V., Mathur, J., 'Performance assessment of smart and energy-efficient buildings under Indian climatic conditions', *Energy and Buildings*, Elsevier
8.	Ascione, F., Bianco, N., De Masi, R. F., Vanoli, G. P., 'Energy refurbishment of existing buildings through the use of smart technologies', *Applied Energy*, Elsevier
Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc19_ce40/preview NPTEL Course-Sustainable Materials and Green Buildings
2.	https://onlinecourses.nptel.ac.in/noc25_ar13/preview NPTEL Course-Sustainable Architecture
3.	https://www.wbdg.org/ce/doe/bto/sbtt Smart Building Technology Training Series by US government building technologies office
4.	https://www.coursera.org/specializations/sustainable-design-practices-in-building-design Coursera Specialization-Sustainable Design Practices in Building Design
5.	https://www.coursera.org/learn/green-building-assessment--certification Coursera Course-Green Building Assessment & Certification
6.	https://en.wikipedia.org/wiki/GreenCE GreenCE Online Education Platform for Green Building Courses and Webinars

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	2	2	1	-	1		-	-	-	1	1	2
CO 2	1	3	1	1	-	-	1	1	1	1	2	1	1
CO 3	1	2	2	3	1	-	1	1	1	1	2	2	1
CO 4	1	1	2	2	2	1	2	1	-	2	1	1	2

Guideline for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	10	10
Understand	10	10
Apply	20	10
Analyse	10	10
Evaluate	-	10
Create	-	-
TOTAL	50	50

DEPARTMENT OF CIVIL ENGINEERING
Board of Studies
Year 2627
CCE KARAD

Government College of Engineering, Karad				
Department of Civil Engineering				
Programme: Double Minors (Multidisciplinary and Specialization Minors)				
CEDO-0802: Major Capstone Project (Design & Development)				
Teaching Scheme			**Examination Scheme**	
Practical	08 Hrs/week		PBE- I	50
			PBE- II	50
Total Credits	04			

Prerequisite : Industrial training, Mini Projects, Smart Building

Course Outcomes (CO): Students will be able to

CO1	Understand the basic concepts and literature related to the selected project topic.
CO2	Analyze and evaluate the impact of a community-focused project.
CO3	Apply effective communication and teamwork skills during project execution.
CO4	Create clear technical reports and deliver effective project presentations.

Course Contents

The main aim of this course is to demonstrate the important attributes like critical thinking, creativity, collaborative efforts and communication skills in students and also to make students aware with the process involved in making product from idea.

Project group consists of THREE students. The group is required to do literature survey, formulate the problem, propose and execute methodology.

The steps involved for completion of project includes, but not limited to:

1. Conceptualization of innovative idea through literature and market survey; site visits; interaction with community or industry, socio economic survey etc.
2. Design of product, processes, methods and systems using multidisciplinary knowledge.
3. Fabrication of product, development of software, measurement methods etc.
4. Deployment, implementation and demonstration of project.
5. Presentation of project.

Projects shall consist of following but not limited to experimental work of various techno social issues, computer based analysis and design, audit of various civil engineering works, innovative civil engineering materials, Environmental impact assessment, small water supply schemes, irrigation schemes, smart transport system, smart cities, water harvesting, waste management system, etc. related to civil engineering.

Project Report Format

For standardization of the project reports the following format should be strictly followed.

1. Page Size: Trimmed A4
2. Top Margin: 1.00 Inch
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch
6. Para Text: Times New Roman 12 Point Font
7. Line Spacing: 1.5 Lines
8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
9. Headings: Times New Roman, 14 Point Bold Face
10. Certificate: All students should attach standard format of Certificate as described by the department.
11. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal/ Director.
12. **Index of Report:**
    a. Title Sheet
    b. Certificate
    c. Acknowledgement

d. Table of Contents
e. List of Figures
f. List of Tables
g. List of abbreviations

13. References: References should have the following format
For Books: "Title of Book", Authors, Publisher, Edition
For Papers: "Title of Paper", Authors, Journal/Conference Details, Year

List of Submission

1. Working model of the project (if any)
2. Project Report
3. Research paper / Conference paper
4. Presentation and demonstration of project in exhibition
5. Project diary (mandatory): hardcopy diary maintained groupwise with weekly activities record signed by the guide. Need to be presented during the End Semester Examination (ESE)

Assessment Pattern

The internal assessment of the project will be done at the end of the semester by a committee consisting of three faculty members from the department along with Project Guide. The students will present their project work before the committee. The presentation of the project shall be of 45min followed by viva voce. The committee members will award the marks to the individual students depending on the group average awarded by the committee.

Each group will submit the copies of the completed project report. One copy will be kept in the departmental library.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	2	-	2	1	-	-	1	-	-	2	3	2
CO 2	2	3	2	2	1	3	1	-	1	1	2	2	2
CO 3	1	-	1	1	2	1	2	3	3	2	1	1	1
CO 4	1	1	-	1	3	1	1	2	3	2	2	1	1

Guideline for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	PBE- I	PBE- II
Remember	-	-
Understand	10	10
Apply	10	10
Analyze	10	10
Evaluate	10	10
Create	10	10
TOTAL	50	50

Government College of Engineering, Karad

PROPOSED SCHEME OF INSTRUCTION

Programme: Honors and Multidisciplinary Minor (Disaster Management)

Minor: Semester – I (Major: Semester – IV)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0403	Fundamentals of Disaster Management	03	--	03	03	50	50	100
		Total	**03**	**-**	**03**	**03**	50	50	100

Minor: Semester – II (Major: Semester – V)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0505	Disaster Risk Reduction and Resilient Infrastructure	03	--	03	03	20	30	50
2	CEHO-0506	Disaster Risk Reduction and Resilient Infrastructure Lab	--	02	02	01	--	50	50
		Total	**03**	**02**	**05**	**04**	**20**	**80**	**100**

Minor: Semester – III (Major: Semester – VI)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0605	Post Disaster Recovery And Resilient Cities	03	--	03	03	20	30	50
2	CEHO- 0606	Post Disaster Recovery And Resilient Cities Lab	--	02	02	01	--	50	50
		Total	**03**	**02**	**05**	**04**	**20**	**80**	**100**

Minor: Semester –IV (Major: Semester – VII)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0703	Advanced Disaster Management and Research Applications	03	--	03	03	50	50	100
		Total	**03**	**-**	**03**	**03**	50	50	100

Minor: Semester –V(Major: Semester – VIII)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							PBE-I	PBE-II	TOTAL
3	CEHO-0803	Major capstone project (design & development)	-	08	08	04	50	50	100
		Total	**-**	**-**	**08**	**04**	50	50	100

L- Lecture P-Practical

FA- Formative Assessment SA - Summative Assessment (For Laboratory End Semester performance)

PBE-I– Project-based Examination (For Laboratory Mid Semester Performance)

PBE- II Project-based Examination (For Laboratory End Semester Performance)

PROGRESSIVE TOTAL CREDITS: 18

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 2026-27 GCE KARAD

Guidelines:-Students will take up 5-6 additional course in the same Engineering/ Technology discipline of 18 credit distributed over semester III –VIII. These 18 credits will be over and above the 176 credits prescribed for four year multidisciplinary bachelor's degree in Engg/Tech Program.

NOTE:

For students enrolled in **Internship mode**, the **examination evaluation for the above-mentioned subjects** will be conducted **online**. Additionally, **all associated academic activities** for these students will also be carried out **online.**

DEPARTMENT OF CIVIL ENGINEERING * COE, BARAD *
Board of Studies
Year
2026-27

Government College of Engineering, Karad

Department of Civil Engineering

Programme: Honors and Multidisciplinary Minor (Disaster Management)

CEHO-0403: Fundamentals of Disaster Management

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		FA	50
Tutorials	00 Hrs/week		SA	50
Total Credits	03			

Prerequisite : Basic Civil Engineering, Environmental Studies.

Course Outcomes (CO): Students will be able to

CO1	Describe disaster management concepts, classifications, and global/national frameworks.
CO2	Analyze structural failures and disaster impacts on infrastructure.
CO3	Apply GIS and remote sensing for disaster risk assessment and mitigation.
CO4	Develop disaster preparedness strategies through case studies and simulations.

	Course Contents	**CO**	**Hours**
Unit 1	**Introduction to Disaster Management** Concepts, definitions, and scope of disaster management. Classification of disasters into natural and man-made. Overview of disaster risk reduction (DRR) and resilience-building approaches.	**CO1**	**(6)**
Unit 2	**Disaster Risk Reduction Frameworks** International policies and frameworks, including the Sendai Framework and UNDRR guidelines. National disaster management policies and institutional frameworks. Role of government and non-governmental organizations in disaster risk reduction.	**CO1**	**(6)**
Unit 3	**Engineering Perspective on Disasters** Causes and consequences of structural failures. Impact of disasters on infrastructure, including buildings, bridges, and transportation networks. Case studies of major infrastructure failures and lessons learned.	**CO2**	**(7)**
Unit 4	**Geospatial Techniques in Disaster Management** Fundamentals of remote sensing and GIS applications in disaster assessment. Hazard mapping, risk zonation, and spatial analysis for disaster mitigation. Case studies on the use of geospatial techniques in disaster preparedness and response.	**CO3**	**(7)**
Unit 5	**Practical Applications in Disaster Management** Hands-on training in GIS and remote sensing for disaster mapping. Simulation exercises for disaster impact assessment. Analysis of historical disaster data using geospatial tools.	**CO3, CO4**	**(7)**
Unit 6	**Case Studies and Lessons from Past Disasters** Analysis of major global and national disasters, their causes, impacts, and response strategies. Best practices in disaster risk reduction and infrastructure resilience. Discussion on ethical, social, and economic implications of disaster management.	**CO2, CO4**	**(7)**

Text Books

1. B. C. Bhandari, Disaster Education and Management: A Joyride for Students, Teachers, and Disaster Managers, Springer, 2014.
2. R. Subramanian, Disaster Management, Vikas Publishing House, 2018.
3. T. Ahmed, Disaster Management: Through the New Millennium, Random Publications, 2013.

Reference Books

1. D. S. Alexander, Principles of Emergency Planning and Management, Oxford University Press, 2015.
2. I. Kelman, Disaster by Choice: How Our Actions Turn Natural Hazards into Catastrophes, Oxford University Press, 2020.
3. P. R. Smith, Environmental Hazards: Assessing Risk and Reducing Disaster, Routledge, 2018.

4.	S. Cutter, Hazards, Vulnerability and Environmental Justice, Routledge, 2012.
Useful Links	
1.	https://www.undrr.org/implementing-sendai-framework United Nations Office for Disaster Risk Reduction (UNDRR), "Sendai Framework for Disaster Risk Reduction 2015–2030,"
2.	https://ndma.gov.in/ National Disaster Management Authority (NDMA) India, "National Disaster Management Plan (NDMP),"
3.	https://www.esri.com/en-us/industries/safety-security/geospatial-disaster-management ESRI, "GIS for Disaster Management,"
4.	https://appliedsciences.nasa.gov/what-we-do/disasters NASA, "Remote Sensing for Natural Disasters,"

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	-	-	-	-	1	1	1	1	2	1	1	-
CO 2	2	3	1	2	-	2	1	1	1	1	1	1	-
CO 3	2	2	3	3	2	1	1	1	1	2	1	1	2
CO 4	2	3	3	3	1	2	1	2	1	1	1	1	2

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	10	10
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	10	10
Create	-	-
TOTAL	50	50

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 2026-27 CCE KARAD

Government College of Engineering, Karad

Department of Civil Engineering

Programme: Honors and Multidisciplinary Minor (Disaster Management)

CEHO- 0505: Disaster Risk Reduction and Resilient Infrastructure

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		FA	20
Tutorials	00 Hrs/week		SA	30
Total Credits	03			

Prerequisite : Basic Civil Engineering, Environmental Studies, Risk Management, Disaster Policies.

Course Outcomes (CO): Students will be able to

CO1	Explain the principles of disaster risk reduction and the role of governance, policies, and stakeholders in resilience building.
CO2	Utilize engineering, geospatial, and digital technologies to enhance infrastructure resilience and disaster risk mitigation.
CO3	Assess the vulnerability of critical infrastructure and evaluate risk-informed decision-making strategies for resilience.
CO4	Critically examine case studies, best practices, and policy frameworks to propose sustainable and resilient infrastructure solutions.

	Course Contents	**CO**	**Hours**
Unit 1	**Fundamentals of Disaster Risk Reduction** Concepts and principles of disaster risk reduction (DRR), hazard identification and risk assessment, and disaster risk governance, Sendai Framework for Disaster Risk Reduction, role of stakeholders in DRR.	**CO1**	**(6)**
Unit 2	**Infrastructure Resilience and Risk Management** Definition and attributes of resilient infrastructure, vulnerability assessment of critical infrastructure, risk-informed decision-making, design strategies for resilient infrastructure, resilience indicators and performance metrics.	**CO3**	**(6)**
Unit 3	**Engineering Approaches for Disaster Resilience** Structural and non-structural mitigation measures, advanced construction materials and techniques, retrofitting and strengthening of existing infrastructure, role of smart technologies in disaster resilience, case studies on resilient infrastructure projects.	**CO2, CO3**	**(7)**
Unit 4	**Geospatial and Digital Technologies in Risk Reduction** Applications of GIS and remote sensing in disaster risk reduction, early warning systems and real-time monitoring, artificial intelligence and machine learning for disaster prediction, digital twins for resilient infrastructure, IoT-based disaster monitoring systems.	**CO2**	**(7)**
Unit 5	**Policy Frameworks and Sustainable Development** Global and national policies on DRR and resilient infrastructure, integration of sustainability in infrastructure planning, climate change adaptation and disaster resilience, role of public-private partnerships, financing mechanisms for resilient infrastructure.	**CO1, CO4**	**(7)**
Unit 6	**Case Studies and Best Practices** Analysis of major disasters and lessons learned, successful resilient infrastructure projects, best practices in disaster risk reduction, community participation in resilience building, and future trends in resilient infrastructure development.	**CO4**	**(7)**

Text Books

1. R. Subramanian, Disaster Management, Vikas Publishing House, 2018.
2. S. C. Sharma, Disaster Management: A Comprehensive Approach, Khanna Publishing, 2020.

Reference Books

DEPARTMENT OF CIVIL ENGINEERING * GCE KARAD * Board of Studies Year 2026-27

1.	A. K. Gupta, S. S. Nair, and P. K. Dey, Environmental Hazards and Disaster Management, The Energy and Resources Institute (TERI), 2017.
2.	S. Kolathayar and T. G. Sitharam, Disaster Risk Reduction for Resilient Communities, Springer, 2020.
3.	R. Prasad, Disaster Management and Mitigation in India: A Developmental Perspective, Concept Publishing, 2014.
Useful Links	
1.	https://www.undrr.org/implementing-sendai-framework United Nations Office for Disaster Risk Reduction (UNDRR), "Sendai Framework for Disaster Risk Reduction 2015–2030,
2.	https://www.worldbank.org/en/topic/disasterriskmanagement Resilient Infrastructure for Disaster Risk Reduction,"
3.	https://www.bis.gov.in/ Bureau of Indian Standards (BIS), "Indian Standards on Disaster-Resistant Construction,"
4.	https://ndma.gov.in/ National Disaster Management Authority (NDMA), "Early Warning Systems & Disaster Preparedness,"

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	2	1	-	1	1	1	1	1	1	1	1	1	-
CO 2	2	2	2	3	3	2	1	2	1	2	2	1	1
CO 3	2	3	2	2	2	2	1	2	1	1	1	1	2
CO 4	3	3	1	3	2	2	1	2	2	2	1	2	1

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	4	4
Understand	4	6
Apply	4	6
Analyse	4	6
Evaluate	4	4
Create	-	4
TOTAL	20	30

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 2026-27 ★CCE KARAD★

Government College of Engineering, Karad				
Programme: Honors and Multidisciplinary Minor (Disaster Management)				
CEHO 0506: Disaster Risk Reduction and Resilient Infrastructure Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week			
Total Credits	**1**		SA	50

Prerequisite : Basic Civil Engineering, Environmental Studies, Risk Management, Disaster Policies..

Course Outcomes (CO): Students will be able to

CO1	Understand and apply fundamental concepts of disaster risk reduction, hazard identification, and risk assessment in infrastructure planning.
CO2	Evaluate the resilience of critical infrastructure using engineering approaches, geospatial technologies, and smart disaster management techniques.
CO3	Analyze policy frameworks, public-private partnerships, and financing mechanisms for disaster resilience and sustainable infrastructure development.
CO4	Demonstrate practical disaster risk reduction strategies through field assessments, simulations, and community engagement initiatives.

Course Contents		**CO**
Activity 1	Conduct a site survey to identify hazards and assess risks using a risk matrix.	**CO1**
Activity 2	Analyze local and national disaster governance frameworks, including the Sendai Framework.	**CO3**
Activity 3	Evaluate the vulnerability of critical infrastructure using assessment tools and field studies.	**CO2**
Activity 4	Develop mitigation strategies based on risk assessment data through scenario-based analysis.	**CO1, CO2**
Activity 5	Demonstrate retrofitting techniques and material testing for structural resilience.	**CO2**
Activity 6	Utilize GIS tools for hazard mapping, spatial analysis, and disaster planning.	**CO2**
Activity 7	Simulate flood or earthquake warning alerts to understand early warning mechanisms.	**CO2**
Activity 8	Explore IoT-based disaster monitoring systems and their real-time applications.	**CO2**
Activity 9	Develop a basic digital twin model for risk assessment and resilience simulation.	**CO2**
Activity 10	Analyze climate-related risks and evaluate sustainability-driven mitigation strategies.	**CO3**
Activity 11	Research and present successful PPP models in disaster risk reduction and resilience.	**CO3**
Activity 12	Plan and conduct a mock drill to train and evaluate emergency response mechanisms.	**CO4**

List of Submission:	
1.	Minimum 8

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 2026-27 GCE KARAD

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	2	1	-	1	1	1	1	1	1	1	1	1	-
CO2	2	2	2	3	3	2	1	2	1	2	2	1	1
CO3	2	3	2	2	2	2	1	2	1	1	1	1	2
CO4	3	3	1	3	2	2	1	2	2	2	1	2	1

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Guidelines for Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Exp 11	Exp 12	Avg
Task I	30	30	30	30	30	30	30	30	30	30	30	30	30
Task II	10	10	10	10	10	10	10	10	10	10	10	10	10
Task III	10	10	10	10	10	10	10	10	10	10	10	10	10
SA	50	50	50	50	50	50	50	50	50	50	50	50	50

Government College of Engineering, Karad

Department of Civil Engineering

Programme: Honors and Multidisciplinary Minor (Disaster Management)

CEHO 0605: Post Disaster Recovery And Resilient Cities

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		FA	20
Tutorials	00 Hrs/week		SA	30
Total Credits	03			

Prerequisite : Disaster Risk Reduction, Urban Planning, Climate Change, Risk Management, and Smart Technologies.

Course Outcomes (CO): Students will be able to

CO1	Explain post-disaster rehabilitation, reconstruction strategies, and engineering standards.
CO2	Utilize engineering, urban planning, and technological solutions to enhance post-disaster recovery efforts.
CO3	Assess socioeconomic, environmental, and infrastructural challenges in disaster-affected urban areas to develop recovery strategies.
CO4	Critically examine case studies and best practices to propose sustainable and resilient urban recovery models.

	Course Contents	**CO**	**Hours**
Unit 1	**Introduction to Post-Disaster Recovery** Concepts and principles of post-disaster recovery, disaster impacts on urban infrastructure and communities, phases of recovery (short-term, medium-term, long-term), governance and institutional frameworks for recovery, global and national disaster recovery policies.	**CO1**	**(6)**
Unit 2	**Planning for Resilient Cities** Urban resilience concepts and frameworks, integration of disaster risk reduction (DRR) in urban planning, land-use planning and zoning regulations for resilience, climate change adaptation strategies, role of smart cities in disaster recovery.	**CO1**	**(6)**
Unit 3	**Infrastructure Rehabilitation and Reconstruction** Damage assessment techniques for buildings, roads, and utilities, retrofitting and strengthening of damaged structures, sustainable reconstruction practices, role of engineering standards and building codes, financing mechanisms for infrastructure recovery.	**CO2, CO3**	**(7)**
Unit 4	**Socioeconomic and Environmental Aspects of Recovery** Socioeconomic challenges in post-disaster recovery, livelihood restoration and community rehabilitation, psychological and cultural aspects of disaster recovery, waste and debris management, environmental sustainability in recovery planning.	**CO3, CO4**	**(7)**
Unit 5	**Technological Innovations for Resilient Cities** Role of GIS and remote sensing in post-disaster assessment, early warning and emergency response technologies, artificial intelligence and machine learning for recovery planning, smart infrastructure solutions for resilient urban development, digital twins for disaster resilience.	**CO2, CO3**	**(7)**
Unit 6	**Case Studies and Best Practices** Analysis of successful post-disaster recovery models, global and national case studies on resilient urban development, lessons learned from major urban disasters, public-private partnerships in post-disaster reconstruction, future trends in post-disaster recovery and resilient city planning.	**CO4**	**(7)**

Text Books

1. A. K. Jha, T. W. Miner, and Z. Stanton-Geddes, Building Urban Resilience: Principles, Tools, and Practice, World Bank Publications, 2013.
2. R. B. Olshansky, L. D. Hopkins, and L. A. Johnson, Disaster Recovery: Planning for a Resilient Future, American Planning Association, 2020.
3. B. K. Paul, Disaster Recovery: Theory and Practice, CRC Press, 2011.

Reference Books

1. Davis, Resilient Cities: Responding to Peak Oil and Climate Change, Island Press, 2010.
2. J. Twigg, Disaster Risk Reduction, Overseas Development Institute (ODI), 2015.
3. M. Gad-el-Hak, Large-Scale Disasters: Prediction, Control, and Mitigation, Cambridge University Press, 2008.

Useful Links

1. http://www.un.org/sustainabledevelopment/ United Nations Office for Disaster Risk Reduction (UNDRR).

DEPARTMENT OF CIVIL ENGINEERING * Board of Studies Year 2026-27 * CCE KARAD *

2.	https://www.nidm.gov.in/ National Institute of Disaster Management (NIDM), "Reconstruction and Rehabilitation Frameworks,"
3.	https://www.undrr.org/implementing-sendai-framework "Sendai Framework for Disaster Risk Reduction 2015–2030,"

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	2	1	-	1	1	1	1	1	1	1	1	1	-
CO 2	2	2	2	3	3	2	1	2	1	2	2	1	1
CO 3	2	3	2	2	2	2	1	2	2	2	1	1	2
CO 4	3	3	1	3	2	2	1	2	2	2	1	2	1

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	4	4
Understand	4	6
Apply	4	6
Analyse	4	6
Evaluate	4	4
Create	-	4
TOTAL	20	30

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 2026-27 CCE KARAD

Government College of Engineering, Karad				
Programme: Honors and Multidisciplinary Minor (Disaster Management)				
CEHO 0606: Post Disaster Recovery And Resilient Cities Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week			
Total Credits	**1**		SA	50

Prerequisite : Disaster Risk Reduction, Urban Planning, Climate Change, Risk Management, and Smart Technologies.

Course Outcomes (CO): Students will be able to

CO1	Understand the principles of post-disaster recovery and analyze governance frameworks for effective reconstruction.
CO2	Apply urban resilience concepts and planning strategies to integrate disaster risk reduction into city development.
CO3	Assess infrastructure damage, implement engineering rehabilitation techniques, and evaluate sustainable reconstruction practices.
CO4	Utilize technological innovations, socioeconomic strategies, and policy frameworks to enhance post-disaster recovery efforts.

Course Contents		**CO**
Activity 1	Conduct a field-based or simulated assessment of disaster impacts on urban infrastructure and communities.	**CO1**
Activity 2	Develop short-term, medium-term, and long-term recovery strategies for a selected disaster scenario.	**CO1**
Activity 3	Utilize GIS tools to analyze urban resilience and plan risk-informed land-use zoning.	**CO2**
Activity 4	Evaluate climate adaptation measures and the role of smart cities in disaster recovery.	**CO2**
Activity 5	Perform structural damage assessments for buildings, roads, and utilities using engineering techniques.	**CO2**
Activity 6	Demonstrate retrofitting techniques and sustainable building practices for post-disaster rehabilitation.	**CO3**
Activity 7	Analyze post-disaster socioeconomic challenges and propose livelihood restoration plans.	**CO3**
Activity 8	Develop an environmentally sustainable debris and waste management strategy for disaster-affected areas.	**CO4**
Activity 9	Use remote sensing data to assess post-disaster conditions and recovery progress.	**CO4**
Activity 10	Implement AI/ML-based tools to analyze disaster recovery data and predict urban resilience trends.	**CO4**
Activity 11	Research successful PPP models for financing and managing post-disaster reconstruction projects.	**CO4**
Activity 12	Evaluate real-world post-disaster recovery case studies and extract key lessons for future urban resilience.	**CO1, CO4**

List of Submission:	
1.	Minimum 8

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 2026-27 CCE KARAD

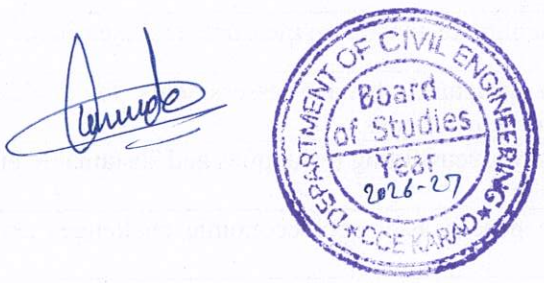
Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	2	1	-	1	1	1	1	1	1	1	1	1	-
CO2	2	2	2	3	3	2	1	2	1	2	2	1	1
CO3	2	3	2	2	2	2	1	2	2	2	1	1	2
CO4	3	3	1	3	2	2	1	2	2	2	1	2	1

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Guidelines for Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Exp 11	Exp 12	Avg
Task I	30	30	30	30	30	30	30	30	30	30	30	30	30
Task II	10	10	10	10	10	10	10	10	10	10	10	10	10
Task III	10	10	10	10	10	10	10	10	10	10	10	10	10
SA	50	50	50	50	50	50	50	50	50	50	50	50	50



Government College of Engineering, Karad

Department of Civil Engineering

Programme: Honors and Multidisciplinary Minor (Disaster Management)

CEHO-0703: Advanced Disaster Management and Research Application

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs./week		FA	50
Tutorials	00 Hrs./week		SA	50
Total Credits	03			

Prerequisite : Awareness of common natural hazards

Course Outcomes (CO): Students will be able to

CO1	Understand basic concept of disaster, hazards, risk and resilience.
CO2	Apply emergency planning and preparedness strategies.
CO3	Analyze disaster risks using data and technology tools.
CO4	Create sustainable, disaster-resilient infrastructure and post-disaster reconstruction strategies.

	Course Contents	**CO**	**Hours**
Unit 1	**Fundamentals of Disaster Processes and Modelling** Introduction to disasters – meaning, scope, and significance in civil engineering, Classification: natural and man-made, Concept of hazard, vulnerability, risk, and resilience, Disaster cycle – mitigation, preparedness, response, and recovery, Structural and non-structural measures for disaster reduction.	**CO1**	**(07)**
Unit 2	**Disaster Preparedness, Emergency Planning, and Response** Institutional framework for disaster management in India, Roles of local bodies, NGOs, Components of an emergency plan: risk assessment, resource inventory, response coordination, Incident Command System (ICS) – structure and operation,role of Maharashtra state disaster management, Evacuation planning and temporary shelter design,	**CO2**	**(08)**
Unit 3	**Risk Communication, Awareness, and Capacity Development** Importance of risk communication in disaster management, Methods of effective communication, Role of media and social media platforms in disaster awareness, Institutional training programs for engineers and planners.	**CO3**	**(07)**
Unit 4	**Research Methods and Data Applications in Disaster Management** Introduction to research in disaster management, Research problem identification and objectives formulation, Data sources: primary (field surveys, interviews) and secondary (reports, satellite data), Use of open-access databases (NDMA, EM-DAT etc.)	**CO3**	**(06)**
Unit 5	**Advanced Technological and Analytical Tools** Applications in hazard mapping and damage assessment, Global Navigation Satellite System (GNSS) and drones in disaster monitoring, Role of Artificial Intelligence (AI), Machine Learning (ML), Modelling and simulation software used in disaster engineering (HEC-RAS, QGIS, ARCGIS etc.)	**CO3**	**(06)**
Unit 6	**Innovation, Case Studies, and Future Research Directions** Innovative practices in resilient infrastructure (flood-resistant housing, earthquake-safe design), Use of sustainable and smart materials in post-disaster reconstruction, Global and national best practices in disaster recovery and mitigation. Case studies ;Japan earthquake, Kerala flood.	**CO4**	**(05)**

List of submission: Assignment and case study

Text Books

1.	A.K. Srivastava "Text book of Disaster management'' scientific publishers.2001 (Unit 1)
2.	Mrinalini Pandey "Disaster management'' WILEY publishers 2023. (Unit 2)

3.	R. subramanian.'' Disaster management'' s.chand publisher. September 2022-2023 (Unit 2)
4	Shirley Harrison . ''Disaster and the media'' .managing crisis communication. Palgrave Macmillan publisher 1999 (Unit 3)
5	Jason D." Rivera Disaster and emergency management methods''. Routledge publisher.2022 (Unit 4)
6	Kumar, S. & Thakur, P ''Disaster Management'' Vikas Publishing House (Unit 5)
7	D.B.N .Murthy " Disaster management" text and case studies . (Unit 6)
Reference Books	
1.	Murthy, D.B.N. Environmental Hazards: Assessing Risk and Reducing Disaster Publisher: Routledge Year: 2013. (Unit 1)
2.	R. Ruthra, P. Sribalaji, Sanupriya ''Disaster management'' Suchitra publication. (Unit 2)
3.	N.V.S.RAJU ''Disaster management '' hazard and risk awareness .B.S publications. (Unit 3)
4.	Nishith rai, A.K. sing ''Disaster management in India" new royal book company. January 2021(Unit 4)
5.	D Satish Kumar and M Sivarajah "Utilizing AI and Machine learning for natural Disaster management" IGI GLOBAL publisher. (Unit 5)
6.	Nicolas A. valcik and Paul E .Tracy ''Case studies in disaster response and emergency management'' ASPA series in public Administration and public policy . (Unit 6)
Useful Links	
1.	https://www.youtube.com/watch?v=gQxs2VJPf4o, "Disaster Recovery and Build Back Better" by Prof. Ram Sateesh Pasupuleti, Prof. Subh Jyothi Samaddar, Department of Architecture and Planning, IIT Roorkee.
2.	https://www.youtube.com/watch?v=v-NGndAd0T4, "Natural Hazards" by Prof.Javed N. Malik, Department of Earth Sciences, IIT Kanpur.
3.	https://www.youtube.com/watch?v=IKUoFJCOtrs, "Disaster Management" by Dr.N. Seenu Vasan, Department of Education, NITTTR.

Mapping of COs and Pos

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	2	1	1	1	1	2	1	1	1	1	2	1
CO 2	2	2	3	1	1	2	2	1	2	2	2	2	2
CO 3	2	3	2	3	3	1	1	1	1	1	2	2	3
CO 4	3	3	3	3	2	2	3	2	2	2	3	3	3

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	10	10
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	-	-
Create	10	10
TOTAL	50	50

Government College of Engineering, Karad				
Department of Civil Engineering				
Programme: Honors and Multidisciplinary Minor (Disaster Management)				
CEHO-0803: Major capstone project (design & development)				
Teaching Scheme			**Examination Scheme**	
Practical	8 Hrs/week		PBE- I	50
			PBE-II	50
Total Credits	04			

Prerequisite: Industrial training, Mini Project

Course Outcomes (CO): Students will be able to

CO1	Conduct a comprehensive literature review for real-world disaster issues.
CO2	Assess real-world disaster risks and vulnerabilities in communities.
CO3	Design and develop practical disaster management solutions.
CO4	Interpret project data, prepare technical reports, and communicate the results effectively through professional presentations.

Course Contents

The main aim of this course is to develop in students the essential qualities of **critical thinking, creativity, collaborative efforts, leadership and communication skills**, and to make them familiar with the **processes involved in designing and developing effective disaster management solutions from concept to implementation**.

A project group shall consist of **THREE students**. The group is required to conduct a detailed literature review, a hazard and vulnerability assessment, problem identification, and the **formulation of appropriate mitigation and management strategies**, followed by the design and development of a suitable solution.

The steps involved in the completion of the project shall include, but are not limited to:

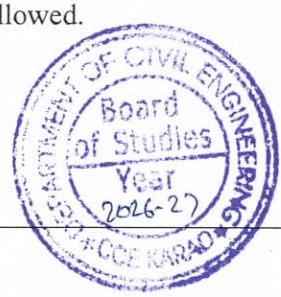
1. **Conceptualization and Problem Identification:** Through literature review, hazard mapping, vulnerability analysis, field surveys, site visits, and interaction with communities and agencies.
2. **Design and Planning:** Development of disaster management strategies including early warning systems, evacuation planning, shelter design, mitigation measures, and resilient infrastructure concepts.
3. **Development and Implementation:** Creation of prototypes, GIS-based models, simulation tools, communication systems, and disaster response mechanisms for all disaster phases.
4. **Testing and Validation:** Performance evaluation of the developed system using simulations, scenario-based analysis, and pilot implementation.
5. **Presentation and Documentation:** Preparation of technical reports, risk maps, management plans, cost estimates, implementation strategies, and future recommendations.

The projects shall consist of, but not be limited to hazard and risk mapping, disaster preparedness and mitigation planning, early warning system design, structural safety and retrofitting strategies, flood and drought management, landslide and cyclone risk reduction, post-disaster damage assessment, climate-resilient infrastructure planning, GIS- and remote-sensing-based disaster analysis, community-based disaster risk management, and post-disaster rehabilitation and reconstruction strategies**, related to the field of** Disaster Management (Design and Development)**.**

Project Report Format

For standardization of the project reports, the following format should be strictly followed.

1. Page Size: Trimmed A4
2. Top Margin: 1.00 Inch
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch



6. Para Text: Times New Roman 12 Point Font
7. Line Spacing: 1.5 Lines
8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
9. Headings: Times New Roman, 14 Point Bold Face
10. Certificate: All students should attach standard format of Certificate as described by the department.
11. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal/ Director.
12. **Index of Report:**
    a. Title Sheet
    b. Certificate
    c. Acknowledgement
    d. Table of Contents
    e. List of Figures
    f. List of Tables
    g. List of abbreviations
13. References: References should have the following format
    For Books: "Title of Book", Authors, Publisher, Edition
    For Papers: "Title of Paper", Authors, Journal/Conference Details, Year

List of Submission

1. Working model of the project (if any)
2. Project Report
3. Research paper / Conference paper
4. Presentation and demonstration of project in exhibition
5. Project diary (mandatory): hardcopy diary maintained groupwise with weekly activities record signed by the guide. Need to be presented during the End Semester Examination (ESE)

Assessment Pattern

The internal assessment of the project will be done at the end of the semester by a committee consisting of three faculty members from the department along with Project Guide. The students will present their project work before the committee. The presentation of the project shall be of 45min followed by viva voce. The committee members will award the marks to the individual students depending on the group average awarded by the committee.

Each group will submit the copies of the completed project report. One copy will be kept in the departmental library.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	2	2	-	2	1	2	-	-	1	-	2	2	1
CO 2	1	2	2	2	1	2	1	-	-	-	2	2	2
CO 3	2	3	3	2	2	3	-	2	1	1	1	2	2
CO 4	1	1	2	2	3	1	-	3	3	1	1	2	3

Guideline for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	PBE-I	PBE-II
Remember	-	-
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	10	10
Create	10	10
TOTAL	50	50

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 2026-27 COE KARAD

Government College of Engineering, Karad

PROPOSED SCHEME OF INSTRUCTION

Programme: Honors and Multidisciplinary Minor (Town planning and real estate)

Minor: Semester – I (Major: Semester – IV)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0402	Principles of Regional Planning	03	--	03	03	50	50	100
		Total	**03**	**-**	**03**	**03**	50	50	100

Minor: Semester – II (Major: Semester – V)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0503	Sustainable Built Environment and Urban Studies	03	--	03	03	20	30	50
2	CEHO-0504	Sustainable Built Environment and Urban Studies Lab	--	02	02	01	--	50	50
		Total	**03**	**02**	**05**	**04**	**20**	**80**	**100**

Minor: Semester – III (Major: Semester – VI)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0603	Legal & Regulatory Framework in Town Planning & Real Estate	03	--	03	03	20	30	50
2	CEHO- 0604	Legal & Regulatory Framework in Town Planning & Real Estate lab	--	02	02	01	--	50	50
		Total	**03**	**02**	**05**	**04**	**20**	**80**	**100**

Minor: Semester –IV (Major: Semester – VII)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0702	Planning theory and techniques	03	--	03	03	50	50	100
		Total	**03**	**-**	**03**	**03**	50	50	100

Minor: Semester –V(Major: Semester – VIII)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							PBE-I	PBE-II	TOTAL
3	CEHO-0802	Major capstone project (design & development)	-	08	08	04	50	50	100
		Total	**-**	**-**	**08**	**04**	50	50	100

L- Lecture P-Practical

FA- Formative Assessment SA - Summative Assessment (For Laboratory End Semester performance)

PBE-I– Project-based Examination (For Laboratory Mid Semester Performance)

PBE- II Project-based Examination (For Laboratory End Semester Performance)

PROGRESSIVE TOTAL CREDITS: 18

DEPARTMENT OF CIVIL ENGINEERING ★ Board of Studies Year 26-27 ★ GCE KARAD

Guidelines:-Students will take up 5-6 additional course in the same Engineering/ Technology discipline of 18 credit distributed over semester III –VIII. These 18 credits will be over and above the 176 credits prescribed for four year multidisciplinary bachelor's degree in Engg/Tech Program.

NOTE:

For students enrolled in **Internship mode**, the **examination evaluation for the above-mentioned subjects** will be conducted **online**. Additionally, **all associated academic activities** for these students will also be carried out **online.**

DEPARTMENT OF CIVIL ENGINEERING
Board of Studies Year 26-27
DBATU, LONERE KARAD

Government College of Engineering, Karad

Second Year (Sem – IV) B. Tech. Civil Engineering

Programme: Honors and Multidisciplinary Minor (Town planning and real estate)

CEHO 0402: Principles of Regional Planning

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		FA	50
Tutorials	00 Hrs/week		SA	50
Total Credits	03			

Prerequisite: Basic knowledge of planning fundamentals.

Course Outcomes (CO): Students will be able to

CO1	explain key concepts and rationale behind urban & regional planning.
CO2	analyse development plans and their implementation in planning organizations.
CO3	evaluate urbanization theories and their impact on urban growth.
CO4	assess historical trends and their influence on modern urban planning.

	Course Contents	CO	Hours
Unit 1	Rationales of Planning and Planning as a Discipline: Various definitions of town and country planning; Goals, objectives and components of planning; Benefits of planning; Different roles of planners.	CO1	(07)
Unit 2	Foundations of Planning: Components of sustainable urban and regional development; Planning knowledge, Economic and societal aspects as bases of town and country planning.	CO1 CO4	(05)
Unit 3	Development Plans and Planning Organizations: Defining development plan; Types and scope of development plans: regional plan, master plan, zonal plan, town planning scheme, Hierarchy of plans and its significance.	CO1 CO2 CO4	(06)
Unit 4	Theories of Urbanization and Role of Planning Organizations: Concentric Zone Theory, Meanings and forms of globalization; Characteristics of a global city, Urban patterns and trends, similarities and differences from Indian cities.	CO1 CO4	(05)
Unit 5	History for planning purposes:- significance, Civilization Development, Cities in India from ancient, medieval era; ancient and Medieval planning in India, modernist city in India	CO1 CO3 CO4	(07)
Unit 6	Criteria of location and development of towns in Asian history; Political, economic, technological, social and cultural factors, study of urban growth, renewal in different cities based on functions, locations, etc.	CO4	(06)

Text Books

1.	"The Oxford Handbook of Urban Planning" edited by R. Crane and R. Weber.
2.	"Sustainable Urban Development Reader" edited by S.M. Wheeler and T. Beatley.
3.	"The City in History" by Lewis Mumford. Mumford
4.	"Urbanization in India: Past and Present" by G. V. Joshi.

Reference Books

1.	"The Urbanization of People: The Politics of Development, Labor Markets, and Schooling in the Chinese City" by Eli Friedman.
2.	"Asian Cities: Colonial to Global" edited by Gregory Bracken.

Useful Links

1.	https://archive.nptel.ac.in/courses/124/107/124107158/
2.	https://nptel.ac.in/courses/124107007

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
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CO 3	2	3	3	1	2	3	1	1	-	-	1	2	3
CO 4	3	1	2	3	3	1	1	3	3	-	1	2	2

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	10	10
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	10	10
Create	-	-
TOTAL	50	50

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 26-27 COE KARAD

Government College of Engineering, Karad

Second Year (Sem – V) B. Tech. Civil Engineering

Programme: Honors and Multidisciplinary Minor (Town planning and real estate)

CEHO 0503: Sustainable Built Environment and Urban Studies

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		FA	20
Tutorials	00 Hrs/week		SA	30
Total Credits	03			

Prerequisite: Fundamentals of environmental science, urban planning concepts.

Course Outcomes (CO): Students will be able to

CO1	explain sustainability principles in the built environment.
CO2	analyze urban planning strategies for sustainable cities.
CO3	evaluate climate resilience and disaster management solutions.
CO4	assess governance frameworks and policy interventions.

	Course Contents	CO	Hours
Unit 1	Foundations of Sustainability in the Built Environment:- Concept of Sustainability & Sustainable Development Goals, Principles of Sustainable Built Environment (Triple Bottom Line: People, Planet, Profit), Urbanization Trends & Challenges (Global vs. Indian Perspective).	CO1	(07)
Unit 2	Sustainable Urban Planning & Smart Cities:-Sustainable Urban Design Strategies (Compact Cities, Mixed Land Use),Sustainable Transport, Smart City Planning, Urban Green Spaces & Biodiversity Conservation, Case Study: Singapore's Smart Sustainable Urban Model.	CO1 CO4	(06)
Unit 3	Resilient Cities & Communities:-Climate Change & Urban Adaptation Strategies, Flood Resilient Urban Infrastructure (Case Study: Netherlands Delta Works), Heat Island Effect & Urban Cooling Solutions.	CO1 CO2 CO4	(06)
Unit 4	Energy Efficiency & Circular Economy in Construction:- Green Building Concepts & Certification Systems (LEED, GRIHA, BREEAM), Waste Management & Circular Economy in Construction, Smart Materials & Technologies for Sustainable Infrastructure.	CO1 CO4	(05)
Unit 5	Ecology & Resource Planning:- Material Sustainability & Lifecycle Analysis, Indoor Environmental Quality and Human Comfort, Inclusive Planning: Social, Economic & Cultural Perspectives.	CO1 CO3 CO4	(07)
Unit 6	Environmental Laws, Development regulations:- Urban Governance & Policy Frameworks, Different development authorities and other organizations, District Planning Committees and Metropolitan Planning Committees, affordable Housing & Inclusive Urban Development.	CO4	(06)

Text Books

1.	R. Crane and R. Weber, Eds., *The Oxford Handbook of Urban Planning*, 1st ed. Oxford, UK: Oxford University Press, 2012.
2.	S. M. Wheeler and T. Beatley, Eds., *Sustainable Urban Development Reader*, 3rd ed. New York, NY: Routledge, 2014.
3.	L. Mumford, *The City in History*, 1st ed. New York, NY: Harcourt, Brace & World, 1961.
4.	G. V. Joshi, *Urbanization in India: Past and Present*, 1st ed. India:

Reference Books

1.	"The Urbanization of People: The Politics of Development, Labor Markets, and Schooling in the Chinese City" by Eli Friedman.
2.	"Asian Cities: Colonial to Global" edited by Gregory Bracken.

Useful Links

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2.	https://nptel.ac.in/courses/124107007

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CO 3	2	3	3	1	2	3	1	1	-	-	1	2	3
CO 4	3	1	2	3	3	1	1	3	3	-	1	2	2

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	4	4
Understand	4	6
Apply	4	6
Analyse	4	6
Evaluate	4	4
Create	-	4
TOTAL	20	30

Government College of Engineering, Karad				
Third Year (Sem – VI) B. Tech. Civil Engineering				
Programme: Honors and Multidisciplinary Minor (Town planning and real estate)				
CEHO-0504:- Sustainable Built Environment and Urban Studies Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week			
Total Credits	**1**		**SA**	**50**

Prerequisite : Basic knowledge of real estate finance, infrastructure planning

Course Outcomes (CO): Students will be able to

CO1	evaluate sustainability indicators, indoor air quality.
CO2	conduct waste audit, Assess the walkability.
CO3	analyze urban land use patterns, past flood data.
CO4	assess building's compliance, simulate energy consumption.

Course Contents		**CO**
Experiment 1	Evaluate sustainability indicators for an urban area by conducting a survey of a selected neighbourhood.	**CO 1**
Experiment 2	Analyze urban land use patterns using GIS tools to study land use in a nearby city prepare a land-use map showing zoning patterns.	**CO 3**
Experiment 3	Measure temperature differences across different urban surfaces like green spaces, concrete roads, and built-up areas.	**CO 1**
Experiment 4	Analyze past flood data as a reference case study.	**CO 3**
Experiment 5	Assess building's compliance with LEED/GRIHA green building standards. Conduct a checklist-based evaluation for aspects like energy efficiency, indoor air quality, and water conservation.	**CO 4**
Experiment 6	Conduct a waste audit of a construction site or local building. Identify types of waste, quantify waste generation, and propose recycling strategies.	**CO 2**
Experiment 7	Assess the walkability and public transport facilities in a selected urban area. Conduct a survey using walkability index parameters like safety, accessibility, pedestrian comfort.	**CO 2**
Experiment 8	Simulate energy consumption and efficiency of a small building using software like eQuest or OpenStudio.	**CO 4**
Experiment 9	Study and review government policies on affordable housing, smart cities, and environmental laws. Prepare a presentation on governance challenges and policy suggestions.	**CO 2**
Experiment 10	Evaluate indoor air quality and thermal comfort in a built environment by Measuring humidity, ventilation, and air quality parameters using simple sensors.	**CO 1**
Experiment 11	Visit to a LEED/GRIHA rated energy efficient building.	**CO 1**

List of Submission:

1.	Minimum number of Experiments : 08

Mapping of COs and POs

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

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Guidelines for Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Exp 11	Avg
Task I	30	30	30	30	30	30	30	30	30	30	30	30
Task II	10	10	10	10	10	10	10	10	10	10	10	10
Task III	10	10	10	10	10	10	10	10	10	10	10	10
SA	50	50	50	50	50	50	50	50	50	50	50	50

DEPARTMENT OF CIVIL ENGINEERING
Board of Studies
Year 26-27
COE KARAD

Government College of Engineering, Karad

Second Year (Sem – V) B. Tech. Civil Engineering

Programme: Honors and Multidisciplinary Minor (Town planning and real estate)

CEHO 0603: Legal & Regulatory Framework in Town Planning & Real Estate

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		FA	20
Tutorials	00 Hrs/week		SA	30
Total Credits	03			

Prerequisite: Fundamentals of environmental science, urban planning concepts.

Course Outcomes (CO): Students will be able to

CO1	explain legal principles in urban planning and real estate.
CO2	apply regulatory frameworks to land acquisition and zoning.
CO3	analyze UDCPA and RERA's impact on real estate transactions.
CO4	evaluate dispute resolution mechanisms in real estate conflicts.

	Course Contents	CO	Hours
Unit 1	Transfer of Property Act 1882 (Conditional Transfer, Ownership, Possession, Sale, Gifts Mortgages), Relevant provisions of Income Tax Act for Real Estate	**CO1**	(07)
Unit 2	Rent Control Act (Lease, Licensing, Renting), Succession Acts in India (Hindu Succession, Muslim Inheritance)	**CO1**	(06)
Unit 3	Town Planning Act, Land Acquisition Act 1894, Easement Act 1882	**CO2**	(06)
Unit 4	Real Estate (Regulation and Development) Act (RERA) 2016: Provisions of RERA, Buyer protection, Role of RERA authorities	**CO3**	(05)
Unit 5	Development Regulations & Control (UDCPR): Development control rules, Zoning laws, Environmental regulations, and its implications.	**CO3**	(07)
Unit 6	Case Laws & Dispute Resolution: Famous Landmark legal cases (Land Acquisition Disputes, Property Disputes, Valuation Disputes, RERA Disputes), Consumer rights, Arbitration and mediation	**CO4**	(06)

Text Books

1.	Mulla, "The Transfer of Property Act",**Publisher**: LexisNexis, 13th Edition, 2018,ISBN: 978-9386515778
2.	Sanjiva Row, "The Law of Rent Control in India",Publisher: Thomson Reuters,7th Edition, 2014,ISBN: 978-9391340428
3.	P.K. Sarkar, "The Land Acquisition Act",Publisher: Eastern Law House,7th Edition, 2015, ISBN: 978-8171772821

Reference Books

1.	H.K. Saharay, "Real Estate (Regulation and Development) Act (RERA) Manual",Publisher: Universal Law Publishing,1st Edition, 2017,ISBN: 978-8131251834
2.	Dr. Paras Diwan, Muslim Law of Inheritance, Universal Law Publishing,ISBN: 978-8175342065

Useful Links

1.	https://archive.nptel.ac.in/courses/124/107/124107158/
2.	https://nptel.ac.in/courses/124107007

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 26-27 GCE KARAD

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	2	2	1	3	3	1	2	1	1	2	2	3
CO 2	3	3	2	1	2	1	2	-	3	1	2	2	2
CO 3	2	3	3	1	2	3	1	1	-	-	1	2	3
CO 4	3	1	2	3	3	1	1	3	3	-	1	2	2

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	4	4
Understand	4	6
Apply	4	6
Analyse	4	6
Evaluate	4	4
Create	-	4
TOTAL	20	30

Government College of Engineering, Karad				
Third Year (Sem – VI) B. Tech. Civil Engineering				
Programme: Honors and Multidisciplinary Minor (Town planning and real estate)				
CEHO 0604:- Urban Infrastructure & Real Estate Development Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week			
Total Credits	**1**		**SA**	**50**

Prerequisite : Basic knowledge of real estate finance, infrastructure planning

Course Outcomes (CO): Students will be able to

CO1	understand of **real estate laws** through hands-on practice.
CO2	develop of **legal drafting skills** (sale deed, lease, succession).
CO3	acquire exposure **to RERA compliance and taxation** in real estate.
CO4	understand of **arbitration and mediation** in property disputes.

Course Contents		CO
Experiment 1	Draft a **Sale Deed** incorporating conditional transfer and mortgage clauses.	**CO 1**
Experiment 2	Calculate **capital gains tax, stamp duty, and registration fees** for a property transaction.	**CO 3**
Experiment 3	Prepare a **rental agreement** following **Rent Control Act** provisions.	**CO 1**
Experiment 4	Analyse inheritance rights under Hindu Succession Act and Muslim Inheritance Law. Compare legal case studies and draft succession plans for different scenarios.	**CO 3**
Experiment 5	Examine a **real-world land acquisition case** and assess compensation calculations.	**CO 4**
Experiment 6	Analyse an **Easement Act 1882** case and its impact on property rights.	**CO 2**
Experiment 7	Study **RERA registration requirements**, analyse project documents, and prepare a **compliance report.**	**CO 2**
Experiment 8	Study zoning maps, classify land uses, and assess environmental impact.	**CO 4**
Experiment 9	Conduct a **mock dispute resolution session**, with role-play as buyer, seller, lawyer, and arbitrator.	**CO 2**
Experiment 10	Analyse and summarize important legal cases related to property disputes. Refer landmark case from the Supreme Court or High Court.	**CO 1**

List of Submission:

1. Minimum number of Experiments : 08

Mapping of COs and POs

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

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 2026-27 GCOE KARAD

Guidelines for Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	30	30	30	30	30	30	30	30	30	30	30
Task II	10	10	10	10	10	10	10	10	10	10	10
Task III	10	10	10	10	10	10	10	10	10	10	10
SA	50	50	50	50	50	50	50	50	50	50	50

overnment College of Engineering, Karad

Second Year (Sem – V) B. Tech. Civil Engineering

Programme: Honors and Multidisciplinary Minor (Town planning and real estate)

CEHO-0702 Planning Theory and Techniques

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		FA	50
Total Credits	03		SA	50

Prerequisite: environmental science, urban planning concepts.

Course Outcomes (CO): Students will be able to

CO1	Explain advanced planning theories, schools of thought, and their critiques.
CO2	Apply technical planning methods to evaluate planning problems.
CO3	Analyse planning instruments and institutional techniques used in contemporary practice.
CO4	Design evaluation frameworks and decision-support approaches for comparing planning alternatives and policies.

	Course Contents	CO	Hours
Unit 1	Advanced Theories & Histories of Planning: Evolution of planning, Classic urban theorists and their impacts: Ebenezer Howard, Le Corbusier, Jane Jacobs, Kevin Lynch, Lewis Mumford, strengths and critiques.	**CO1**	**(06)**
Unit 2	Analytical & Quantitative Techniques for Planning: Data collection & sampling for urban surveys; socio-economic and household surveys. Land-use suitability analysis. GIS and spatial analysis. Introduction to transportation/land-use interaction models.	**CO1**	**(06)**
Unit 3	Plan-making Techniques & Policy Instruments: Types of plans, choice and hierarchy (regional, master plans, local area plans, Town Planning Schemes, development control rules). Land management: zoning, subdivision rules, development charges, Transfer/Trading of Development Rights (TDR), land pooling, land readjustment.	**CO2**	**(06)**
Unit 4	Participatory, Institutional & Governance Techniques: participatory techniques, Institutional analysis: roles of municipal bodies, development authorities, DPCs/ MPCs, RERA , governance challenges and multi-level coordination, conflict management and negotiation techniques.	**CO3**	**(05)**
Unit 5	Urban Form & Place-making: Principles of urban design as a planning technique, tactical urbanism, place making techniques and small-scale interventions that support planning goals.	**CO3**	**(04)**
Unit 6	Policies and strategies for directing urbanization trends in India:- Basic issues in urbanization policy and role of national and state level policies, 5 year plans, latest attempts at urbanization policy formulation in the country, salient features of the report of National commission of urbanization, study of national policies-national urban policy framework 2018, population and the environment, economy and urbanisation case studies	**CO4**	**(06)**

Text Books

1.	The Oxford Handbook of Urban Planning (eds. R. Crane & R. Weber). OUP USA; Reprint edition (9 July 2015); Oxford University Press Inc; productsafety@penguin.co.uk ISBN-10:0190235268 ISBN-13 : 978-0190235260 (Unit 1,2,5,6)
2.	Bhende A.A. and Tara Kanitkar (2019)- Principles of Population Studies, Himalaya Publishing House , Mumbai(Unit 1,2,3,5,6)
3.	K.B.Pathak, F. Ram (1998) Techniques of Demographic Analysis ISBN 13, 978-93-5367-824-1 Himalaya Publishing House , Mumbai (Unit 4,5,6)

Reference Books

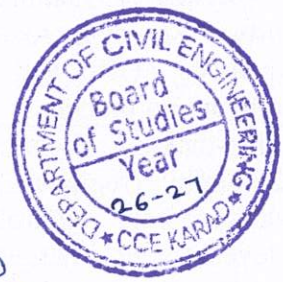
1.	K.C.Shivaramkrishnan, Amitabh Kundu, B.N.Singh, (2007) Handbook on Urbanisation in India
2.	Phadke V.S. & Swapna Banerjee Guha (Ed) (2007) – Urbanisation, Development and Environment- Rawat Publications New Delhi.
Useful Links	
1.	https://youtu.be/q_XmlG3CwNk
2.	https://documents1.worldbank.org/curated/en/276171555961423303/pdf/Urban-Growth-Scenarios-Guidebook.pdf

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	2	2	1	3	3	1	2	1	1	2	2	3
CO 2	3	3	2	1	2	1	2	-	3	1	2	2	2
CO 3	2	3	3	1	2	3	1	1	-	-	1	2	3
CO 4	3	1	2	3	3	1	1	3	3	-	1	2	2

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	4	4
Understand	4	6
Apply	4	6
Analyse	4	6
Evaluate	4	4
Create	-	4
TOTAL	20	30



Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
Programme: Honors and Multidisciplinary Minor (Town planning and real estate)				
CEHO-0802: Major Capstone Project (Design & Development)				
Teaching Scheme			**Examination Scheme**	
Practical	08 Hrs/week		PBE - I	50
			PBE - II	50
Total Credits	04			

Prerequisite : Industrial training, real estate management.

Course Outcomes (CO): Students will be able to

CO1	Apply detail literature survey to the project topic of work.
CO2	Evaluate and analyze impact of a project that focuses on community issues.
CO3	Develop communication and teamwork skills.
CO4	Represent knowledge and technical report writing skills.

Course Contents

The main aim of this course is to demonstrate the important attributes like critical thinking, creativity, collaborative efforts and communication skills in students and also to make students aware with the process involved in making product from idea.

Project group consists of THREE students. The group is required to do literature survey, formulate the problem, propose and execute methodology.

The steps involved for completion of project includes, but not limited to:

1. Conceptualization of innovative idea through literature and case studies, site visits, interaction with community or industry, socio economic survey, demographic surveys etc.
2. Design of product, processes, methods and systems using multidisciplinary knowledge in view of planning and infrastructure development.
3. Fabrication of model, development of software, analysis etc. considering social impact issues in developing cities.
4. Deployment, implementation and demonstration of project.
5. Presentation of project.

Projects shall consist of followings but not limited to experimental work of various techno social issues, computer based analysis and design, use of building/development guidelines environmental impact assessment, smart cities, etc. related to civil engineering.

Project Report Format

For standardization of the project reports the following format should be strictly followed.

1. Page Size: Trimmed A4
2. Top Margin: 1.00 Inch
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch
6. Para Text: Times New Roman 12 Point Font
7. Line Spacing: 1.5 Lines
8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
9. Headings: Times New Roman, 14 Point Bold Face
10. Certificate: All students should attach standard format of Certificate as described by the department.
11. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal/ Director.
12. **Index of Report:**
    a. Title Sheet

b. Certificate
c. Acknowledgement
d. Table of Contents
e. List of Figures
f. List of Tables
g. List of abbreviations

13. References: References should have the following format
For Books: "Title of Book", Authors, Publisher, Edition
For Papers: "Title of Paper", Authors, Journal/Conference Details, Year

List of Submission

1. Working model of the project (if any)
2. Project Report
3. Research paper / Conference paper
4. Presentation and demonstration of project in exhibition
5. Project diary (mandatory): hardcopy diary maintained groupwise with weekly activities record signed by the guide. Need to be presented during the End Semester Examination (ESE)

Assessment Pattern

The internal assessment of the project will be done at the end of the semester by a committee consisting of three faculty members from the department along with Project Guide. The students will present their project work before the committee. The presentation of the project shall be of 45min followed by viva voce. The committee members will award the marks to the individual students depending on the group average awarded by the committee.

Each group will submit the copies of the completed project report. One copy will be kept in the departmental library.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	2	3	1	3	2	1	2	2	2	1	3	3	3
CO 2	2	3	3	2	2	3	2	2	2	2	2	3	3
CO 3	1	2	2	1	1	2	2	3	3	2	2	2	2
CO 4	1	1	2	1	2	1	3	2	3	2	2	2	2

Guideline for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	PBE - I	PBE - II
Remember	-	-
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	10	10
Create	10	10
TOTAL	50	50

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 26-27 COE KARAD

Government College of Engineering, Karad

PROPOSED SCHEME OF INSTRUCTION

Programme: Honors and Multidisciplinary Minor (Environmental Sustainability)

Minor: Semester – I (Major: Semester – IV)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0401	United Nations Sustainable Development Goals	03	--	03	03	50	50	100
		Total	**03**	**-**	**03**	**03**	50	50	100

Minor: Semester – II (Major: Semester – V)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0501	Sustainable Engineering Concepts and Life Cycle Analysis	03	--	03	03	20	30	50
2	CEHO-0502	Sustainable Engineering Concepts and Life Cycle Analysis Lab	--	02	02	01	--	50	50
		Total	**03**	**02**	**05**	**04**	**20**	**80**	**100**

Minor: Semester – III (Major: Semester – VI)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0601	Environment, social and governance	03	--	03	03	20	30	50
2	CEHO- 0602	Environment, social and governance Lab	--	02	02	01	--	50	50
		Total	**03**	**02**	**05**	**04**	**20**	**80**	**100**

Minor: Semester –IV (Major: Semester – VII)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							FA	SA	TOTAL
1	CEHO-0701	Environment, health and safety	03	--	03	03	50	50	100
		Total	**03**	**-**	**03**	**03**	50	50	100

Minor: Semester –V(Major: Semester – VIII)

Sr. No.	Course Code	Course Title	L	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME		
							PBE-I	PBE-II	TOTAL
3	CEHO-0801	Major capstone project (design & development)	-	08	08	04	50	50	100
		Total	**-**	**-**	**08**	**04**	50	50	100

L- Lecture P-Practical

FA- Formative Assessment SA - Summative Assessment (For Laboratory End Semester performance)

PBE-I– Project-based Examination (For Laboratory Mid Semester Performance)

PBE- II Project-based Examination (For Laboratory End Semester Performance)

PROGRESSIVE TOTAL CREDITS: 18

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 26-27 CCE KARAD

Guidelines:-Students will take up 5-6 additional course in the same Engineering/ Technology discipline of 18 credit distributed over semester III –VIII. These 18 credits will be over and above the 176 credits prescribed for four year multidisciplinary bachelor's degree in Engg/Tech Program.

NOTE:

For students enrolled in **Internship mode**, the **examination evaluation for the above-mentioned subjects** will be conducted **online**. Additionally, **all associated academic activities** for these students will also be carried out **online.**

DEPARTMENT OF CIVIL ENGINEERING
Board of Studies
Year
26-27
CCE KANAD

Government College of Engineering, Karad

Department of Civil Engineering

Programme: Honors and Multidisciplinary Minor (Environmental Sustainability)

CEHO 0401: United Nations Sustainable Development Goals

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		FA	50
Tutorials	00 Hrs/week		SA	50
Total Credits	03			

Prerequisite : Nil

Course Outcomes (CO): Students will be able to

CO1	Differentiate between sustainability, sustainable development, and the sustainable development goals.
CO2	Recognise the role of united nations, the 2030 agenda, and international agreements.
CO3	Analyse how governments, businesses and civil societies can actively participate in implementation of sustainable development goals.
CO4	Analyse how sustainable development goals are monitored, tracked and reported.

	Course Contents	**CO**	**Hours**
Unit 1	Introduction, United Nations and a World in Order, Scenario of Current Model of Growth and Development Need for Change, Definition of Sustainability, Aspects of Sustainability, Transition from MDGs to SDGs, The Role of UN and the Need for SDGs and Adoption by the World	**CO1, CO2**	**(06)**
Unit 2	Scope and Inclusion and Agenda 2030, Our Common Future and Philosophy behind SDGs, Distinction between Development and Sustainable Development, Circular economy, Design for sustainability, Thinking Alternatives and Innovation, Causal Mapping, Systemic Mapping and Problem Identification	**CO1, CO2**	**(07)**
Unit 3	Identifying probable interventions for SD, Framework and Structuring of Seventeen SDGs SDG 1: No Poverty SDG 2: Zero Hunger SDG 3: Good Health and Well-being SDG 4: Quality Education SDG 5: Gender Equality SDG 6: Clean Water and Sanitation SDG 7: Affordable and Clean Energy SDG 8: Decent Work and Economic Growth SDG 9: Industry, Innovation and Infrastructure SDG 10: Reduced Inequality SDG 11: Sustainable Cities and Communities SDG 12: Responsible Consumption and Production SDG 13: Climate Action SDG 14: Life Below Water SDG 15: Life on Land SDG 16: Peace and Justice Strong Institutions SDG 17: Partnerships to achieve the Goal	**CO1, CO3, CO4**	**(07)**
Unit 4	Interrelationships and Connections between Seventeen SDGs, SDG Structure and Order at Levels of People (SDG 1 - 10), Ecological (SDG 11 - 15) and Spiritual (SDG 16 - 17) SDGs and Socio Ecological Systems: Economy SDGs 8, 9, 10, 12; Society SDGs 1, 2, 3, 4, 5, 7, 11, 16; Biosphere SDGs 6, 13, 14, 15	**CO1, CO3**	**(07)**
Unit 5	Financing the SDGs and Global Funds, Implementation Planning, Capacity Building and Finance Climate Change Conferences and Summits such as Rio Earth Summit 1992, Kyoto Protocol 1995, Paris Agreement 2015, COP 26 2021, etc.	**CO3**	**(06)**
Unit 6	Case Studies from around the World, Implementation at International Level, Global Reports Case studies from India, Implementation at National Level, National Reports Nodal Agency for Implementation in India, Effective Strategy for Implementation in Indian	**CO3, CO4**	**(07)**

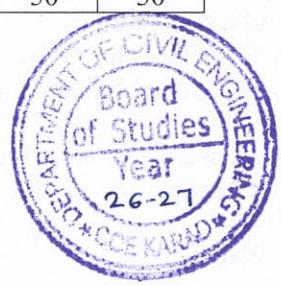
	Scenario, State Level Reports, Assessment of Implementation and Checking its Effectiveness		
Text Books			
1.	S. Hazra and A. Bhukta, "Sustainable Development Goals: An Indian Perspective", Switzerland: Springer International Publishing, 2020		
2.	A. Ziai, "Development Discourse and Global History: From Colonialism to the Sustainable Development Goals", London and New York: Routledge, 2016.		
Reference Books			
1.	OECD, "Sustainable Results in Development: Using the SDGs for Shared Results and Impact", Paris: OECD Publishing, 2019		
Useful Links			
1.	http://www.un.org/sustainabledevelopment/		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	2	-	-	-	-	-	1	2	-	-	1	-	1
CO 2	1	-	-	2	1	1	1	2	-	1	-	1	-
CO 3	1	-	2	-	1	2	1	2	1	-	-	2	-
CO 4	1	1	-	2	-	-	1	1	-	-	-	2	-

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	10	10
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	10	10
Create	-	-
TOTAL	50	50



Government College of Engineering, Karad				
Programme: Honors and Multidisciplinary Minor (Environmental Sustainability)				
CEHO-0501: Sustainable Engineering Concepts and Life Cycle Analysis				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		FA	20
Tutorials	00 Hrs/week		SA	30
Total Credits	03			

Prerequisite : Environmental Science, Sustainability concept

Course Outcomes (CO): Students will be able to

CO1	Explain fundamental concepts of sustainability and the importance of Life Cycle Analysis (LCA)
CO2	Apply environmental data collection and analysis methods for conducting LCA studies.
CO3	Evaluate and interpret the results of LCAs for sustainable design and decision-making.
CO4	Analyze case studies to explore practical applications of sustainable engineering and green technologies.

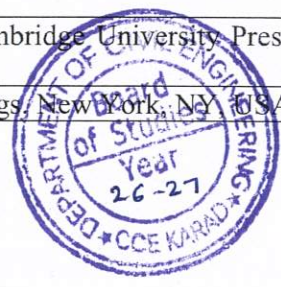
	Course Contents	CO	Hours
Unit 1	**Fundamentals of Sustainability and Life Cycle Analysis** Introduction to Sustainability Concepts, Material Flow and Waste Management, Water-Energy-Food Nexus and Engineering Implications Introduction to Life Cycle Analysis (LCA), Life Cycle Analysis and Sustainability	**CO1**	**(06)**
Unit 2	**Environmental Risk and Life Cycle Framework** Understanding Environmental Risks and Assessment Methods, Case Studies on Chemical Risks and Health Impacts, Characterization of Environmental Problems, Introduction to LCA Framework, Life Cycle Analysis in Risk Management	**CO1**	**(07)**
Unit 3	**Environmental Data Collection and LCA Methodology** Environmental Data Collection Methods and Issues, Statistical Analysis of Environmental Data, Common Analytical Instruments. Overview of LCA Methodology - Goal Definition, Life Cycle Inventory, Life Cycle Impact Assessment, Life Cycle Interpretation. Introduction to LCA Software Tools	CO2	**(07)**
Unit 4	**Life Cycle Assessment and ISO Standards** Detailed LCA Methodology with Practical Examples; Benefits, Limitations, and Ethical Considerations of LCA; ISO Framework for LCA: Standards and Best Practices; Interpretation of LCIA Results and Decision-Making	CO2, CO3	**(07)**
Unit 5	**Sustainable Design and Materials** Factors for a Good LCA Study (Data Quality, System Boundaries); Selection of Sustainable Materials and Green Technologies; Design for Sustainability: Economic, Environmental, and Social Indicators; Sustainable Engineering Principles and Environmental Cost Analysis	CO3, CO4	**(06)**
Unit 6	**Applied Sustainability – Case Studies and Real-World Applications** Sustainability in Waste Management and Water Treatment; Energy and Resource Efficiency in Industrial Processes; Comparison of Hand Drying Methods, Biofuels for Transportation, Kerosene Lamp vs. Solar Lamp, Bioplastic etc.; Emerging Trends in Sustainability and Future Directions	CO4	**(07)**

Text Books

1. O. Jolliet, M. Saade-Sbeih, S. Shaked, and A. Jolliet, Environmental Life Cycle Assessment. Boca Raton, FL, USA: CRC Press, 2015.
2. R. Brinkmann, Introduction to Sustainability. Hoboken, NJ, USA: Wiley-Blackwell, 2016.

Reference Books

1. M. A. Curran, Life Cycle Assessment Handbook: A Guide for Environmentally Sustainable Products. Hoboken, NJ, USA: Wiley-Scrivener, 2012.
2. B. R. Bakshi, Sustainable Engineering: Principles and Practice. Cambridge, U.K.: Cambridge University Press, 2019.
3. W. McDonough and M. Braungart, Cradle to Cradle: Remaking the Way We Make Things, New York, NY, USA:



	North Point Press, 2002.
Useful Links	
1.	https://www.iso.org/standard/37456.html **ISO 14040 – Life Cycle Assessment Standard**
2.	https://eplca.jrc.ec.europa.eu/ **European Platform on LCA (EPLCA)**

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	2	-	-	-	1	2	1	1	-	-	2	2	1
CO 2	2	2	1	-	1	1	1	1	-	1	2	2	2
CO 3	1	2	2	1	2	1	-	1	1	1	2	3	3
CO 4	1	2	2	1	2	1	-	1	1	1	2	3	3

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	4	4
Understand	4	6
Apply	4	6
Analyse	4	6
Evaluate	4	4
Create	-	4
TOTAL	20	30

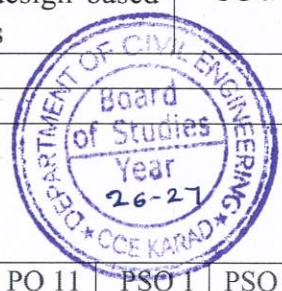
Government College of Engineering, Karad				
Programme: Honors and Multidisciplinary Minor (Environmental Sustainability)				
CEHO-0502: Sustainable Engineering Concepts and Life Cycle Analysis Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week			
Total Credits	**1**		SA	50

Prerequisite : Environmental Science, Sustainability concept, LCA

Course Outcomes (CO): Students will be able to

CO1	Understand and apply LCA methodologies and software tools
CO2	Analyze and interpret Life Cycle Impact Assessment (LCIA) results
CO3	Utilize LCA for eco-design, product improvement, and sustainability decision-making
CO4	Develop practical skills in using LCA tools for real-world applications

	Course Contents	CO
Experiment 1	**Introduction to LCA software tools (SimaPro / GaBi / Open LCA)** **Activity:** Basic navigation, familiarizing with interface, setting up simple projects, and understanding core functionalities.	**CO1**
Experiment 2	**Defining the goal, scope, functional unit, and system boundaries** **Activity:** Defining the scope for a simple product/system, selecting functional unit, and specifying boundaries in the software tool.	**CO1**
Experiment 3	**Life Cycle Inventory (LCI) analysis** **Activity**: Inputting basic data for a product (e.g., energy, materials, emissions etc.) and understanding LCI data management in the software.	**CO1**
Experiment 4	**Life Cycle Impact Assessment (LCIA)** **Activity:** Running the impact assessment using a predefined dataset and interpreting results for a few key impact categories (e.g., global warming, acidification).	**CO2**
Experiment 5	**Sensitivity and Uncertainty Analysis** **Activity:** Setting up and running sensitivity analysis by modifying key input parameters, analyzing how changes affect results, and understanding uncertainty.	**CO2**
Experiment 6	**Interpreting and presenting LCA results** **Activity:** Generating reports, visualizing results (graphs, charts), and discussing implications of the findings.	**CO3**
Experiment 7	**Case study analysis** **Activity:** Applying LCA to a real-world product/system, analyzing life cycle stages, and identifying key environmental impacts.	**CO3, CO4**
Experiment 8	**Applying LCA for eco-design and product improvement** **Activity:** Identifying opportunities for improvement in product design based on LCA results, running simulations in the software for alternatives	**CO3, CO4**
List of Submission:		
1.		



Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	2	-	-	-	1	2	1	1	-	-	2	2	1
CO2	2	2	1	-	1	1	1	1	-	1	2	2	2
CO3	1	2	2	1	2	1	-	1	1	1	2	3	3
CO4	1	2	2	1	2	1	-	1	1	1	2	3	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Guidelines for Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Avg
Task I	30	30	30	30	30	30	30	30	30
Task II	10	10	10	10	10	10	10	10	10
Task III	10	10	10	10	10	10	10	10	10
SA	50	50	50	50	50	50	50	50	50

Government College of Engineering, Karad				
Programme: Honors and Multidisciplinary Minor (Environmental Sustainability)				
CEHO-0601: Environmental, Social and Governance				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		FA	20
Tutorials	00 Hrs/week		SA	30
Total Credits	03			

Prerequisite : Environmental Science, Sustainability concept, LCA

Course Outcomes (CO): Students will be able to

CO1	Understand the core principles of ESG and their role in business sustainability.
CO2	Analyze and evaluate environmental, social, and governance practices in different industries and organizations.
CO3	Apply ESG frameworks and reporting tools to assess sustainability practices and performance.
CO4	Critically assess the relationship between ESG performance and financial outcomes, including ESG investment strategies.

	Course Contents	CO	Hours
Unit 1	**Introduction to ESG and Business Sustainability** **Definition of ESG**: Environmental, Social, and Governance principles. **The Importance of ESG**: Role in business strategy, societal impact, and long-term value creation. **Historical Context and Evolution**: Transition from CSR to ESG. **Global Trends and Regulations**: Overview of international ESG frameworks (EU Taxonomy, SEC guidelines). **Stakeholder Engagement**: Identifying and understanding key stakeholders, ESG expectations.	**CO1**	**(06)**
Unit 2	**Environmental Pillars of ESG** **Climate Change and Carbon Footprint**: Assessing and reducing environmental impact. **Sustainable Resource Use**: Energy, water, raw material efficiency, and waste management. **Biodiversity and Ecosystem Preservation**: Minimizing environmental harm. **Environmental Reporting**: Tools and standards (CDP, GRI). **Regulatory Compliance**: Environmental laws and policies.	CO2, CO3	**(07)**
Unit 3	**Social Pillars of ESG** **Human Rights and Labor Practices**: Fair wages, working conditions, diversity, equity, and inclusion. **Community Engagement and Development**: Building relationships with local communities. **Product Safety and Customer Well-being**: Ethical production and consumer protection. **Diversity, Equity, and Inclusion (DEI)**: Importance in hiring, leadership, and products. **Employee Relations and Well-being**: Health, safety, and work-life balance.	CO2	**(07)**
Unit 4	**Governance Pillars of ESG** **Corporate Governance Structures**: Board composition, executive pay, and accountability. **Ethical Business Practices**: Anti-corruption, transparency, and legal compliance. **Risk Management and Internal Controls**: Establishing frameworks to manage governance risks. **Shareholder Rights and Activism**: Protection and corporate accountability. **Reporting and Transparency**: Governance disclosures and audits.	CO2	**(07)**
Unit 5	**ESG Investing** **Introduction to ESG Investing**: Sustainable and responsible investment strategies. **ESG Investment Strategies**: Impact investing, SRI, and ESG integration. **Metrics and Ratings**: Understanding ESG ratings agencies (MSCI, Sustainalytics). **Financial vs. ESG Performance**: Analyzing the correlation. **Regulatory Considerations**: ESG regulations for investors (SFDR, others).	CO3, CO4	**(06)**
Unit 6	**Case Studies and Best Practices Related to ESG and Business Sustainability** **Case Study 1: Successful ESG Implementation**: Companies like Patagonia or Unilever.	CO4	**(07)**

	Case Study 2: ESG Failures and Lessons Learned: Examples like Volkswagen's emissions scandal. **Sustainability in Action**: Reviewing corporate sustainability programs. **Industry-Specific Best Practices**: Examples for various industries (tech, manufacturing, etc.). **Future Trends in ESG**: Emerging trends and technologies in ESG.		

Text Books	
1.	J. L. Clements and M. McDonald, Principles of sustainable business. Routledge, 2020.
2.	S. Schaltegger, R. Burritt, and H. Petersen, Sustainability accounting and reporting, 2nd ed. Springer, 2017.
Reference Books	
1.	A. Brockett and Z. Rezaee, Corporate sustainability: Integrating performance and reporting. Wiley, 2012.
2.	S. E. Berman, The business guide to effective compliance and ethics: Why compliance isn't working and how to fix it. Wiley, 2015.
3.	
Useful Links	
1.	https://www.globalreporting.org **Global Reporting Initiative (GRI)**
2.	https://www.cdp.net **CDP (Carbon Disclosure Project)**
3.	https://www.unglobalcompact.org **UN Global Compact**:
4.	https://www.msci.com/esg-investing **MSCI ESG Ratings**

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	2	1	1	-	2	1	-	2	-	2	3	2
CO 2	3	3	2	2	-	3	2	-	3	-	2	3	3
CO 3	3	3	3	3	3	3	2	-	3	2	3	3	3
CO 4	2	3	3	3	3	3	2	-	3	3	3	3	3

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	4	4
Understand	4	6
Apply	4	6
Analyse	4	6
Evaluate	4	4
Create	-	4
TOTAL	20	30

Government College of Engineering, Karad				
Programme: Honors and Multidisciplinary Minor (Environmental Sustainability)				
CEHO-0602: Environmental, Social and Governance Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week			
Total Credits	**1**		SA	50

Prerequisite : Environmental Science, Sustainability concept, LCA

Course Outcomes (CO): Students will be able to

CO1	Apply ESG frameworks to assess sustainability performance.
CO2	Conduct evaluations of corporate ESG practices.
CO3	Analyze ESG impacts on business and compliance.
CO4	Recommend improvements for sustainable strategies.

Course Contents

Implementation of following concepts

Guidelines for Experimentation, Presentation, and Report Preparation

1. Pre-Lab Preparation

i. Research the assigned ESG topic and its relevance to:
   a. Carbon footprint assessment and sustainability metrics
   b. Life Cycle Assessment (LCA) methodology and applications
   c. Corporate ESG disclosures and sustainability reporting frameworks
   d. Environmental compliance and governance structures in industries
   e. ESG risk assessment and stakeholder engagement strategies
   f. Financial impact of ESG practices on investment and market valuation

ii. Prepare a list of key observations, data points, and analysis methods for each experiment.

iii. Familiarize yourself with required tools, software (e.g., LCA software, ESG rating tools), and regulatory frameworks before conducting experiments.

iv. Ensure safety measures and ethical research principles while handling environmental data.

2. Lab Experiment Conduct

i. Follow structured methodologies for data collection and analysis.

ii. Observe and record environmental, social, and governance performance indicators.

iii. Utilize sustainability frameworks such as GRI, CDP, and ISO standards for data interpretation.

iv. Perform calculations, assessments, and simulations as per the assigned experiments.

v. Engage in discussions with faculty or industry professionals to gain insights into real-world ESG implementation.

vi. Ensure ethical handling of ESG data and maintain research integrity.

3. Presentation Guidelines

i. Structure the presentation with:
   a. Introduction to the ESG topic and objectives of the experiment
   b. Key findings, observations, and practical implications
   c. Graphs, charts, and case studies to support analysis
   d. Recommendations for improving ESG performance in industries

ii. Use visual aids like infographics, sustainability dashboards, and statistical analysis.

iii. Keep content concise, well-organized, and aligned with ESG reporting standards.

iv. Highlight key learnings and real-world applications of ESG principles.

4. Report Writing Guidelines

i. **Introduction**: Provide background on the experiment, its relevance, and objectives.

ii. **Methodology**: Describe the tools, frameworks, and processes used in conducting the experiment.

iii. **Findings**: Present data-driven insights, sustainability performance metrics, and compliance issues.

iv. **Analysis & Discussion**: Compare findings with industry benchmarks, ESG regulations, and case studies.

v. **Conclusion & Recommendations**: Propose strategies for improving ESG practices in businesses.

vi. **References**: Use proper citations from ESG reports, sustainability frameworks, and academic sources.

5. Case Study Analysis

i. Select a real-world ESG case study on:
   a. Successful ESG implementation (e.g., Unilever, Tesla, Patagonia)
   b. ESG failures (e.g., Volkswagen emissions scandal, BP oil spill)
   c. ESG-driven investment decisions and market trends

ii. Outline the sustainability framework, regulatory compliance, and financial impacts.

Critically evaluate challenges, outcomes, and future recommendations.

List of Submission:	
1.	ESG report
2.	Case Study Analysis

Mapping of COs and POs

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

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	SA
Remember	10
Understand	10
Apply	10
Analyse	10
Evaluate	10
Create	-
TOTAL	50

Government College of Engineering, Karad

Programme: Honors and Multidisciplinary Minor (Environmental Sustainability)

CEHO-0701: Environmental, Health and Safety

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		FA	20
Tutorials	00 Hrs/week		SA	30
Total Credits	03			

Prerequisite : Environmental Science, Sustainability concept, LCA, ESG

Course Outcomes (CO): Students will be able to

CO1	Explain key concepts of environment, health, and safety (EHS) and their interrelationships.
CO2	Identify workplace and environmental hazards, risk factors, and preventive measures.
CO3	Apply EHS management systems and regulatory frameworks to real-world situations.
CO4	Evaluate case studies on industrial safety, occupational health, and environmental risk management.

	Course Contents	CO	Hours
Unit 1	**Introduction to Environment, Health, and Safety (EHS)** — Importance and scope of EHS, sustainable industrial practices, EHS policies and legislation in India (Factories Act, EPA, OSHA, ISO 14001 & 45001).	**CO1**	**(06)**
Unit 2	**Environmental Management Systems (EMS)** — Pollution prevention, environmental audit, waste minimization, emergency preparedness, life cycle approach in EHS management.	**CO1, CO3**	**(07)**
Unit 3	**Occupational Health** — Occupational diseases, ergonomics, industrial hygiene, noise and dust exposure, ventilation, personal protective equipment (PPE).	**CO2**	**(07)**
Unit 4	**Industrial Safety Management** — Hazard identification and risk assessment (HIRA), accident causes, investigation, safety culture, fire and explosion hazards, safety performance indicators.	**CO2, CO3**	**(07)**
Unit 5	**Risk Assessment and Control Techniques** — Quantitative and qualitative risk assessment, HAZOP, FMEA, fault tree analysis, risk communication, and mitigation planning.	**CO3**	**(06)**
Unit 6	**Case Studies and Best Practices** — Case studies from process industries, construction safety management, emergency response planning, disaster management framework (NDMA), and global EHS trends.	**CO4**	**(07)**

Text Books

1. D. A. Crowl and J. F. Louvar, Chemical Process Safety: Fundamentals with Applications, 3rd Ed., Pearson, 2011. (Units 4, 5)
2. N. V. Subramanyam, Industrial Safety, Health and Environment Management Systems, 2nd Ed., McGraw Hill, 2014. (Units 1, 2, 3)

Reference Books

1. Hughes, P. and Ferrett, E., Introduction to Health and Safety at Work, 6th Ed., Routledge, UK, 2016. (Units 1, 3, 4)
2. Goetsch, D. L., Occupational Safety and Health for Technologists, Engineers, and Managers, 9th Ed., Pearson, 2019. (Units 3, 4, 6)
3. Kletz, T., What Went Wrong? Case Histories of Process Plant Disasters, 5th Ed., Gulf Professional Publishing, 2009. (Units 4, 5, 6)
4. International Labour Organization (ILO), Guidelines on Occupational Safety and Health Management Systems (ILO-OSH 2001), Geneva. (Units 2, 3, 4)

Useful Links

1. **https://www.ilo.org** International Labour Organization portal providing global OSH standards, codes of practice, and training resources relevant to occupational health and industrial safety.
2. https://www.cpcb.nic.in Central Pollution Control Board website with environmental regulations, pollution control guidelines, and compliance frameworks supporting EMS and EHS audits.
3. **https://www.iso.org/iso-14001-environmental-management.html** Official ISO resource explaining ISO 14001 (EMS) and ISO 45001 (OH&S) standards, certification structure, and PDCA approach.

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 26-27 *CCE KARAD*

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	2	1	-	-	-	3	2	-	1	-	1	1	-
CO 2	2	3	1	2	1	3	2	-	-	-	1	2	1
CO 3	3	2	2	2	2	3	-	1	1	1	2	3	2
CO 4	1	2	2	2	-	3	2	1	2	-	2	2	2

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	FA	SA
Remember	4	4
Understand	4	6
Apply	4	6
Analyse	4	6
Evaluate	4	4
Create	-	4
TOTAL	20	30

Government College of Engineering, Karad				
Programme: Honors and Multidisciplinary Minor (Environmental Sustainability)				
CEHO-0801: Major capstone project (design & development)				
Laboratory Scheme:			**Examination Scheme:**	
Practical	8 Hrs/week		PBE- I	50
Total Credits	04		PBE-II	50

Prerequisite : Environmental Science, Sustainability concept, LCA, ESG, EHS

Course Outcomes (CO): Students will be able to

CO1	Perform detail literature survey on the project topic of work.
CO2	Evaluate and analyze impact of a project that focuses on community issues.
CO3	Develop communication and teamwork skills.
CO4	Possess presentation and technical report writing skills.

Course Contents

The main aim of this course is to demonstrate the important attributes like critical thinking, creativity, collaborative efforts and communication skills in students and also to make students aware with the process involved in making product from idea.

Project group consists of THREE students. The group is required to do literature survey, formulate the problem, propose and execute methodology.

The steps involved for completion of project includes, but not limited to:

1. Conceptualization of innovative idea through literature and market survey; site visits; interaction with community or industry, socio economic survey etc.
2. Design of product, processes, methods and systems using multidisciplinary knowledge and sustainable design principles.
3. Fabrication of product prototypes, development of software, creation of measurement or analysis methods, or modeling of systems. etc.
4. Deployment, implementation and demonstration of project.
5. Presentation of project.

The projects may include but are not limited to experimental works addressing various techno-social issues, computer-based analysis and design, health monitoring of structures, development of innovative and sustainable construction materials, environmental impact assessment studies, design of small-scale water supply or irrigation schemes, smart transportation or city systems, rainwater harvesting, sewerage and sanitation system design, waste management systems, and other sustainability-oriented civil engineering projects, life cycle assessment, environmental health and safety, environment social and governance .

Project Report Format

For standardization of the project reports the following format should be strictly followed.

1. Page Size: Trimmed A4
2. Top Margin: 1.00 Inch
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch
6. Para Text: Times New Roman 12 Point Font
7. Line Spacing: 1.5 Lines
8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
9. Headings: Times New Roman, 14 Point Bold Face
10. Certificate: All students should attach standard format of Certificate as described by the department.
11. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal/ Director.

12. Index of Report:

a. Title Sheet
b. Certificate
c. Acknowledgement
d. Table of Contents
e. List of Figures
f. List of Tables
g. List of abbreviations

13. References: References should have the following format
For Books: "Title of Book", Authors, Publisher, Edition
For Papers: "Title of Paper", Authors, Journal/Conference Details, Year

List of Submission

1. Working model of the project (if any)
2. Project Report
3. Research paper / Conference paper
4. Presentation and demonstration of project in exhibition
5. Project diary (mandatory): hardcopy diary maintained groupwise with weekly activities record signed by the guide. Need to be presented during the End Semester Examination (ESE)

Assessment Pattern

The internal assessment of the project will be done at the end of the semester by a committee consisting of three faculty members from the department along with Project Guide. The students will present their project work before the committee. The presentation of the project shall be of 45min followed by viva voce. The committee members will award the marks to the individual students depending on the group average awarded by the committee.

Each group will submit the copies of the completed project report. One copy will be kept in the departmental library.

Mapping of COs and POs

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

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	PBE I	PBE II
Remember	10	10
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	10	10
Create	-	-
TOTAL	50	50

DEPARTMENT OF CIVIL ENGINEERING Board of Studies Year 26-27 COE KARAD