

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	TOTAL
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	TOTAL
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	TOTAL
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	TOTAL
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	TOTAL
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

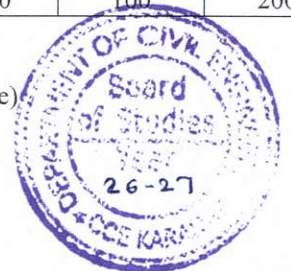
SA - Summative Assessment (For Laboratory End Semester performance)

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 additional 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.



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	PSO 2
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




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

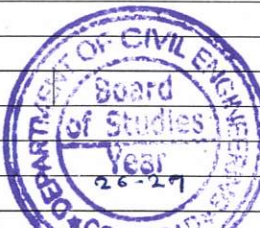
PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	-	-	-	-	-	-	-	1	2	1	2	1	2
CO 2	-	-	-	-	2	3	3	3	2	2	2	2	1	1
CO 3	3	-	-	2	3	3	2	3	2	2	3	2	2	2

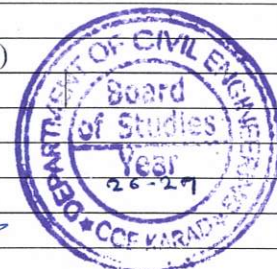
Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

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.				





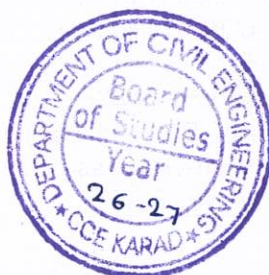
5.	Building materials and construction by SS Bhavikatti.		
Useful Links			
1.	https://easyengineering.net/building-materials-duggal/		
2.	https://bharatskills.gov.in/Home/StudyMaterial?var=EDAGX24kJCO/9o2J0MaRDg==&Default=YES		

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, Gol.
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)

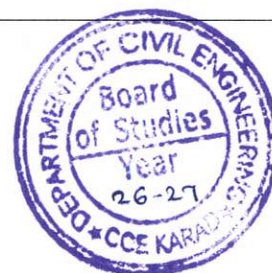
3: Substantial(High)

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/			

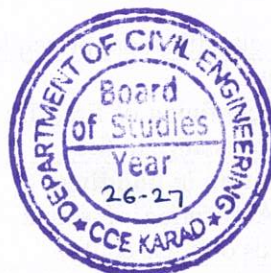


PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	-	-	-	-	1	1	-	-	-	-	2	2
CO 2	2	-	-	-	-	2	2	-	-	-	-	2	2
CO 3	2	-	-	-	-	2	2	-	-	-	-	2	2
CO 4	1	-	-	-	-	1	1	-	-	-	-	2	2

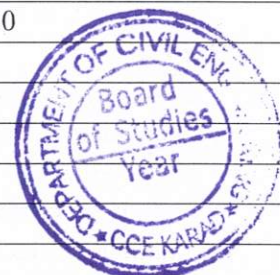
Guidelines for Assessment Pattern (with revised Bloom's Taxonomy)

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

Example



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, 1 st Edition, 2009. (Unit 3 and 4)				
6.	Majumdar, M. (Ed), Energy efficient Buildings in India, Tata Energy Research Institute, Ministry of Non-				



(Signature)

	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, “ <i>BIM Handbook</i> ”, 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=sDfINQurIIE , “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

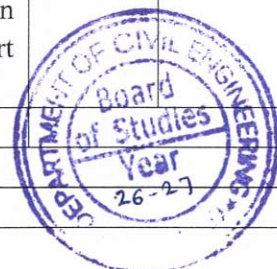
PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	2	-	1	2	2	-	1	1	-	2	3	2
CO 2	3	3	2	-	2	3	2	-	-	1	2	3	2
CO 3	3	2	3	2	3	2	-	2	2	2	2	3	3
CO 4	3	3	2	3	3	3	1	-	2	1	2	3	3

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

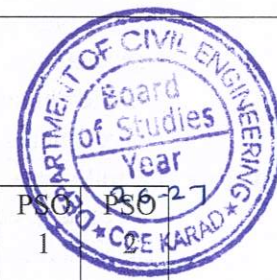
1. Wadhawan, V. K., 'Smart Structures: Blurring the Distinction between the Living and the Nonliving', Oxford University Press, Oxford. 1st Edition
2. Addington, D. M., Schodek, D. L., 'Smart Materials and New Technologies for Architecture and Design Professions', Architectural Press, Elsevier, UK. 1st 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/doc/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	PO 12	PO 13
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



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

