EMERGING TRENDS IN CIVIL ENGINEERING **Course Code : 315315**

Programme Name/s	**: Civil Engineering/ Civil & Rural Engineering/ Construction Technology/ Civil & Environmental Engineering/**
Programme Code	**: CE/ CR/ CS/ LE**
Semester	**: Fifth**
Course Title	**: EMERGING TRENDS IN CIVIL ENGINEERING**
Course Code	**: 315315**

I. RATIONALE

Civil Engineering is the oldest form of engineering and also the discipline of thinking and building. However, in the era of latest technological development, a civil engineer is required to keep himself updated with the latest trend and techniques in the field to stay competitive and avoid falling behind ensuring its scientific priority and significance. There are genuine, realistic applications and benefits to updating the industry's current needs. These cutting-edge building innovations fundamentally change the scenario of construction sector. It is therefore necessary to figuring out how to incorporate these advancements into their strategies and workflows in various ways. This course will help the learners to know the basic knowhow of all such emerging trends in civil engineering.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Suggest the relevant emerging techniques for the given civil engineering works.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Suggest the relevant softwares for given construction projects.
- CO2 - Select the relevant advance materials for given civil engineering work.
- CO3 - Propose the suitable advance construction equipments for the given work situation.
- CO4 - Adopt the relevant techniques for sustainable construction.
- CO5 - Suggest the relevant advance techniques for given construction activity.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
315315	EMERGING TRENDS IN CIVIL ENGINEERING	ETC	DSC	3	-	-	-	3	1	1.5	30	70*#	100	40	-	-	-	-	-	-	100

Total IKS Hrs for Sem. : 0 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 10 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Describe merits and demerits of soft computing techniques. TLO 1.2 Suggest the suitable software/s for the given purpose in construction activity.	**Unit - I Softwares in Civil Engineering** 1.1 Merits and Demerits of soft computing technique. 1.2 Applications of Civil Engineering softwares : Build-Master, HEC-RAS, STRAP, WaterGEMS, ArcGIS, STAAD-Pro, RISA-Connection, MIDAS, Building Information Modeling (BIM), Procore, Primavera Pro, Virtual Reality Software-VR, MX Road Software, Building Planning & Management System (BPMS), Plaxis 3D, Autodesk Construction Cloud, Powerplay, Geo5.	Lecture Using Chalk-Board Video Demonstrations Presentations Demonstration
2	TLO 2.1 Suggest the advanced construction material for given type of construction. TLO 2.2 Enumerate the properties of given construction material. TLO 2.3 Use the relevant advance construction material for the given purpose in construction activity.	**Unit - II Advance Construction Materials** 2.1 Properties and applications of building materials: Pollution absorbing bricks, Cooling bricks, 3D printed bricks, Interlocking bricks, Translucent wood, Sound proofing walls, Epoxy flooring. 2.2 Properties and applications of road materials: Recycled asphalt shingles, Self healing asphalt, Precast Pre-stressed Concrete Panels (PPCP) 2.3 Properties and applications of concrete materials: Synthetic concrete, New admixtures: Masterglanium, Polycarboxylic Ether, Nano concrete, Light transmitting concrete, Foam concrete, Bendable concrete or Engineered Cementitious Composite (ECC), Concrete Fabric, Hydrophobic concrete, Green concrete, Timbercrete, Ferrock.	Lecture Using Chalk-Board Presentations Video Demonstrations Case Study

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Suggest the relevant survey equipment for specified purpose. TLO 3.2 Propose the relevant type of construction equipment for given purpose. TLO 3.3 Suggest the relevant advance material handling equipment in given situation.	**Unit - III Advance Construction Equipments** 3.1 Survey equipments: LiDAR, Direct Reading Grade Rods, 3D Laser scanning, Robotic Markout, Google Earth. 3.2 Construction equipments: Earth moving equipment: Skid and crawler loaders, Trenchers, Scrappers, Wheeled loading shovels, Advanced plastering machine, Bridge girder launcher. 3.3 Material handling equipments: Types of cranes: Floating crane, Rough terrain crane, Bridge Over head crane, Conveyors, Hoists, Types of Forklifts: Telehandler forklift, Rough Terrain forklift, Types of paver: Tracked pavers, Hybrid offset paver, Side feeders, Road header, and Types of Tunnel boring machine: Horizontal boring, Vertical boring, Line boring.	Lecture Using Chalk-Board Presentations Video Demonstrations Case Study
4	TLO 4.1 Explain the necessity of energy audit with relevant methods. TLO 4.2 Propose the relevant recyclable material for the given construction activity. TLO 4.3 Explain the term,	**Unit - IV Sustainability in Construction** 4.1 Energy Audit: Necessity and methods. 4.2 Properties of renewable ,recyclable material and recycling of construction debris with its applications. 4.3 Sustainable Drainage system(SuDs) : Principles, Components and Benefits of SuDs.	Lecture Using Chalk-Board Presentations Video Demonstrations Case Study
5	TLO 5.1 Use the relevant building construction techniques for the specified purpose in construction activity. TLO 5.2 Suggest the relevant road construction technique in given situation. TLO 5.3 Undertake the relevant ground improvement technique in the given situation.	**Unit - V Advance Construction Techniques** 5.1 Building construction techniques: Pre-engineered building using Mivan technology, Façade Technology, Fire protection buildings, 3D printing. 5.2 Road construction techniques: Road Printer, Smart roads, Anti-icing roads, Piezoelectric roads, Hyper loop construction, Precast arch bridge construction. 5.3 Ground improvement techniques: Advanced piling techniques : Mono piling, Micro Piles, Soil Nailing, Sand Drains, Pre-Fabricated Vertical Drains, Thermal Methods: Soil heating and Soil freezing.	Lecture Using Chalk-Board Presentations Video Demonstrations Case Study

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES : NOT APPLICABLE.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Prepare a report on Zero Energy Building and Green Building stating its case study mentioning material required advantages and disadvantages and applications etc.
- Prepare a report on advanced tools/equipments for the site safety.
- Prepare the charts showing different types of safety rules and regulations of site.
- Prepare a report on Techniques of Earthquake Resistant Structures mentioning methods, merits, practical difficulties, applications etc.
- These are optional activities, which can be preferred by students for extra learning.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system (Any computer system with appropriate configuration)	All
2	LCD Projector with accessories	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Softwares in Civil Engineering	CO1	6	6	6	2	14
2	II	Advance Construction Materials	CO2	6	6	6	2	14
3	III	Advance Construction Equipments	CO3	8	8	6	4	18
4	IV	Sustainability in Construction	CO4	4	4	4	2	10
5	V	Advance Construction Techniques	CO5	6	6	6	2	14
Grand Total				**30**	**30**	**28**	**12**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Two unit test (MCQ) of 30 marks each will be conducted and average of two-unit test to be considered.

Summative Assessment (Assessment of Learning)

- Online MCQ examination

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	1	1	1	2	1	-	2			
CO2	2	2	3	2	1	-	3			

CO3	2	2	1	3	1	-	2			
CO4	2	2	2	2	3	-	3			
CO5	2	2	1	2	3	-	2			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	MSBTE, Mumbai.	Learning Manual of Emerging Trends in Civil Engineering	MSBTE, Mumbai.
2	Dr. Manoranjan Samal	Advanced Construction Techniques and Equipment	S.K. Kataria & Sons, 2022, ISBN: 978-93-5014-751-1
3	Dr. R. P. Rethaliya	Advanced Construction and Equipment	Atul Prakashan, Ahmedabad, 1 January 2019, ISBN: 978-93-81518.94-6
4	Dr. R. Vigneswaran	Advanced Construction Technology	Magnus Publication, ISBN: 978-81-964838-0-7
5	K. Ganesh Babu, H. Sudarsana Rao, Y. Amarnath	Emerging Trends in Civil Engineering Select Proceedings of ICETCE 2018	Springer Publication, 12 January 2020 ISBN:978-9811514036
6	Mohit Bajpai Dr. A.V. Sudhakara Reddy and Dr. V. Lakshmi Devi	Emerging Trends in Engineering and Technology (Volume - 5)	Integrated Publicaions, New Delhi, ISBN:978-93-93502-97-1

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.engineeringcivil.com/softwares.	Introduction of software in civil engineering
2	https://www.nbmcw.com/tech-articles/concrete/3725-new-construction-materials-for-modern-projects.html	Advance construction material
3	https://geniebelt.com/blog/10-innovative-construction-materials	Innovative construction material
4	https://www.viatechnik.com/blog/modern-construction-machines-theyre-used/	Modern construction machines
5	https://www.academia.edu/28172313/ADVANCED_BUILDING_CONSTRUCTION_EQUIPMENT	Advance building construction equipments
6	https://theconstructor.org/construction/sustainability-construction-civil-engineering/9492/	Concept of sustainability
7	https://www.susdrain.org/delivering-suds/using-suds/suds-components/suds-components	Sustainable drainage system(SuDs)
8	https://www.designingbuildings.co.uk/wiki/Advanced_construction_technology	Advanced construction technology
9	https://www.constructionjunkie.com/blog/2018/1/7/the-16-most-interesting-advances-in-construction-technology-of-2017	Most interesting advances in construction technology
10	https://mysubs.in/buy/recent-trends-in-civil-engineering-and-technology-journal-subscription?gclid=Cj0KCQjw6IfoBRCiARIsAF6q06scZ5teDIexIYz_j85yy2ZH_v1kiQcytNvYf3AelfE3LcZndTbhrOwaAqv2EALw_wcB.	Recent Trends In Civil Engineering & Technology (RTCET)
11	https://www.nobroker.in/blog/mivan-construction-technology-explained/	Mivan construction technology

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

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