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|  | **National Institute of Technology Meghalaya**An Institute of National Importance | **CURRICULUM** |
| Programme | **Master of Technology**  | Year of Regulation | **2018-19** |
| Department | **Civil Engineering** | Semester | **II** |
| Course Code | Course Name | Pre-requisite | Credit Structure | Marks Distribution |
| L | T | P | C | INT | MID | END | Total |
| **CE 588** | **Sustainable Materials** | **NIL** | **3** | **0** | **0** | **3** | **50** | **50** | **100** | **200** |
| Course Objectives | 1. To understand the basic concept of sustainability
2. To learn about alternative material as construction and building materials,
3. To learn about life cycle analysis
4. To learn fundamentals about green buildings
5. To learn basic concept of economic analysis
 | Course Outcomes | CO1 | To implement the sustainability in construction practices |
| CO2 | To analyse sustainability aspect of construction  |
| CO3 | To understand life cycle analysis concept and its implications |
| CO4 | To implement green building rating system |
| CO5 | To perform economic analysis and benefit cost ratio comparative study. |
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| SYLLABUS |
| No. | Content | Hours | COs |
| I | **Sustainability**Definition, fundamental of sustainability, role of materials and embodied energy, ecological foot-print and its calculation. | **6** | CO1 |
| II | **Sustainable Materials**Definition, sustainability issue of conventional construction materials, Alternative materials like fly-ash, constructionand demolition waste etc. and their use in construction, Case studies.  | **6** | CO1, CO2 |
| III | **Measuring Sustainability**Introduction, Sustainability vs common indicator, Life Cycle Assessment and Sustainability, environment risk assessment, Sustainability impact assessment, input output model etc.  | **6** |  CO2, CO3 |
| IV | **Green Buildings**Energy efficient building, green building performance criteria, optimization of building design for energy conservation, building rating system. Example of green building, industrial approach to sustainability, Case studies. | **6** | CO4 |
| V | **Economic Analysis** Basic concept of economic analysis, cost-benefit component, benefit determination, shadow pricing, techniques of economic evaluation.  | **6** | CO5 |
| Total Hours | **36** |  |
| **Essential Readings** |
| 1. Spiegel, R, Meadows, D. Green Building materials, third edition, Wiley Publications
 |
| 1. Hauschild, Michle Z., Rosenbaum, Ralph K,. Life cycle assessment: Theory and Practices, 2007 Springer publication
 |
| 1. Green new building rating system, Report (2014), Indian green building council
 |
| **Supplementary Readings** |
| 1. Munier.N, Introduction to sustainability, Springer publication, 2005
 |
| 1. World Commission on Environment and Development. 1987. Our Common Future. Oxford: OUP
 |
| 1. Choudhary, I., Hashmi, S., Encyclopedia of Renewable and Sustainable materials, Ist Edition, 2020, Elsvier publication
 |
| 1. Hamilton, B.A., Green building economic impact study, September 2015, US green building council
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