MGM University

Jawaharlal Nehru Engineering College, Aurangabad

Curriculum framework

Master of Architecture (Environmental)

(With effect from Academic Year 2020-2021)

MAHATMA GANDHI MISSION
MGM UNIVERSITY, AURANGABAD
Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

Institute Vision

To create self-reliant, continuous learning & competent technocrats imbued with human values.

Institute Mission

Imparting quality technical education to the students through participative teaching-learning process.

Developing competence amongst the students through academic learning and practical experimentation.

Inculcating social mindset and human values amongst the students.

Department Vision

The Department of Architecture will strive to become one of the best Institutes imparting Architectural Education in the country. Efforts will be made to inculcate in the students the importance of research in Architecture and also cherish values in life in today's context.

Department Mission

To create a humane environment for better living and happy life of human beings. Emphasis will be on sustainable development and to make conscious efforts for the concept of Green Buildings.

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1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. Become an expertise in the field of environmental architecture to cater to the needs of the current and future societies.

2. Finding or generating a visionary employment which can create a sustainable habitat which is the need of future.

3. Taking active participation in policy making government bodies to create a self-resilient systems and policies to cater to the needs of the society.

4. Obtaining technical and advanced knowledge to contribute to new research areas or innovations in the field of environmental architecture**.**

5. This program educational knowledge should develop new ideas, innovators and entrepreneurs to serve the society as a guide to become a sustainable and less impacting society.

Program Specific Objectives (PSOs)

At the end of the program, the student

PSO 1: Should able to apply the knowledge gained during the program from environmental and allied fields in particular to identify, formulate and solve real life problems, and become a green consultant for the society.

PSO 2: Should be able to give expert solutions to the builders, architects, and planners all the stack holders of development to become sustainable developed society at large.

PSO 3: should be able to give technical knowledge to building industry to become more and more green to preserve the resources and reduce impact on environment.

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Program Outcomes (POs)

1. **Architectural knowledge:** Learn and Apply the knowledge of all the subjects related to Master of Environmental field along with the healthy environment of society and Human beings.

2. **Problem analysis:** Identify, formulate, research literature, and analyze the issues during designing by taking cognizance from case studies for achieving sustainable and user-friendly design solutions.

3. **Design/development of solutions:** Solutions for complex design problems and propose a service system with sustainable approach that meet the specified needs with appropriate consideration for public health and safety, Housing, Public transportation, art, cultural, societal, and environmental considerations along with economy and aesthetics.

4. **Conduct investigations of complex problems:** The problems:

• That cannot be solved by straightforward application of knowledge, theories and techniques applicable to the Environmental Architectural discipline.

• That may not have a unique solution. For example, an environmental solution can be applied in many ways and lead to multiple possible solutions.

• That requires consideration of appropriate constraints (Climate, Topography, Environment and Economy) / requirements not explicitly given in the problem statement. (Like: cost, energy requirement, durability, Material life, expertise is expected for any Solution etc.).

• Which need to be defined (modeled) within appropriate statistical methodology framework.

• That often requires use of modern computational concepts and tools.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern designing, simulation or analysis tools, including prediction, modeling and assessment to complex Environmental Architectural designing urban designing or environmental planning, with an understanding of the limitations.

6**. The Architects and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional environmental Architectural practice.

7. **Environment and sustainability:** Understand the impact of the professional environmental solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commitment to professional ethics responsibilities and norms of the environmental practice through bylaws, morals, code & conducts.

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

10. Communication: Communicate effectively on complex Environmental and Architectural activities with the Environmental Architects and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, green certifications and give and receive clear instructions.

11**. Project management and finance:** Demonstrate knowledge and understanding of the Environmental Architectural field and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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PEO / PO Mapping:

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
I	√	√	√		√		√	√				
II				√	√	√	√	√	√	√		
III			√			√	√		√	√	√	√
IV	√				√	√		√	√	√	√	√
V	√				√	√		√	√	√	√	√

Mapping of Course Outcome and Programme Outcome

Year	Sem	Subjects	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
I	I	CRDS	√	√	√	√					√	√		√
		BP I	√	√			√							
		GBMCT	√				√	√						√
		EM		√			√		√				√	√
		BSS					√	√			√			
		EE							√		√			
	II	EEDS	√	√	√	√						√	√	√
		BP II	√				√							
		SDP						√	√		√		√	
		BSM	√				√		√				√	
		RM										√		√
II	I	SPS	√	√	√	√								√
		Diss I		√	√							√		√
		GBRS	√				√	√	√	√	√		√	
		ELL						√	√	√	√			
		EIAEM					√	√	√	√	√		√	
		PT	√											
	II	Diss II		√	√							√		√
		Electives	√			√						√		√

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Program Overview:

Master of Architecture (Environmental) is a Two-years post-graduate program approved by the Council of Architecture, New-Delhi. The program is designed for 2 years full time with Choice based credit system. The 2 years program is demarcated into 4 semesters followed with 100 credits. The assessment criteria is based on the grading system and carried out at the end of every academic semester.

<table>
<tr><th colspan="5">M.ARCH (ENVIRONMENTAL ARCHITECTURE)</th></tr>
<tr><th>Year</th><th colspan="2">First Year</th><th colspan="2">Second Year</th><td rowspan="11">Study Tours, interaction with industry professionals or experts, Site visits.</td></tr>
<tr><th>Semester</th><th>Sem I</th><th>Sem II</th><th>Sem I</th><th>Sem II</th></tr>
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<tr><td rowspan="2">BUILDING SCIENCES AND APPLIED ENGINEERING</td><td>Building Physics -I</td><td>Building Physics –II</td><td>Green Building Rating Systems</td><td></td></tr>
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<tr><td>Ecology and Environment</td><td>Research Methodology Environmental and Ecological Planning</td><td>EIA and Environmental Management</td><td></td></tr>
<tr><td rowspan="3">PROFESSIONAL ELECTIVES & OPEN ELECTIVES</td><td>Dynamic facades</td><td>GIS and Terrain Mapping</td><td>Sustainable Housing Policies</td><td>Smart and Eco Cities</td></tr>
<tr><td>Disasters Management & Mitigation</td><td>Sustainable Transport systems</td><td>Contemporary Practices in Sustainable Architecture</td><td>Sustainable Urban Conservation,</td></tr>
<tr><td>Urban Public spaces</td><td>Landscape and environmental design</td><td>Post Occupancy Evaluation</td><td>Adaptive reuse and retrofit</td></tr>
<tr><td colspan="4">MOOC Courses and Swayam Courses</td></tr>
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Teaching and Evaluation Scheme (2020-2021)

List of Abbreviations:

S.No.	Acronym	Full Form
1	**L**	Theory Lecture/Hours per week
2	**S**	Studio/Hours per week
3	**CA1**	Continues Assessment up to mid of semester
4	**CA2**	Continues Assessment from mid to end of semester
5	**ESE-(TH) Paper**	End semester Examination -Theory Paper
6	**ESE-(SV)**	End semester Examination -Sessional Viva
7	**ESE-(STW)**	End semester Examination Sessional Term Work Assessment

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Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21
Teaching and Evaluation Scheme (2020-2021)

First Year

Semester I

Subject Course	Course	Teaching Scheme		Evaluation Scheme						
		L	S	CA1	CA2	ESE-Paper	ESE-SV	ESE-STW	Total	Credits
MARE20111	Climate Responsive Design Studio	1	6	125	125	Nil	250	Nil	500	10
MARE20112	Building Physics -I	2	4	25	25	100	Nil	50	200	4
MARE20113	Green Building Materials and construction technology	2	2	25	25	100	Nil	Nil	150	3
MARE20114	Energy Management	2	2	25	25	Nil	Nil	100	150	3
MARE20115	Building Simulation Software	0	4	25	25	Nil	Nil	50	100	2
MARE20116	Ecology and Environment	2	0	10	10	80	Nil	Nil	100	2
MARE20117	Elective-I	1	2	25	25	Nil	Nil	50	100	2
MARE20117A	Dynamic facades									
MARE20117B	Disasters Management & Mitigation									
MARE20117C	Urban Public spaces									
		Total	10	20	260	260	280	250	250	1300

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First Year

Semester II										
Subject Course	**Course**	**Teaching Scheme**		**Evaluation Scheme**						
		L	**S**	**CA1**	**CA2**	**ESE-Paper**	**ESE-SV**	**ESE-STW**	**Total**	**Credits**
MARE20121	Energy Efficient Design Studio	1	6	125	125	Nil	250	Nil	500	10
MARE20122	Building Physics –II	2	4	50	50	Nil	Nil	100	200	4
MARE20123	Sustainable Development & Planning	2	4	25	25	100	Nil	50	200	4
MARE20124	Building Services and Management	2	2	25	25	100	Nil	Nil	150	3
MARE20125	Research Methodology	2	2	20	20	50	Nil	60	150	3
MARE20126	Elective-II	1	2	25	25	Nil	Nil	50	100	2
MARE20126A	GIS and Terrain Mapping									
MARE20126B	Sustainable Transport systems									
MARE20126C	Landscape and environmental design									
Total		10	20	270	270	250	250	260	1300	26

List of Abbreviations

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6	**ESE-(SV)**	End semester Examination -Sessional Viva
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Teaching and Evaluation Scheme (2020-2021)

Second Year

Semester III

Subject Course	Course	Teaching Scheme		Evaluation Scheme						
		L	S	CA1	CA2	ESE-Paper	ESE-SV	ESE-STW	Total	Credits
MARE20211	Sustainable Planning Studio	1	6	125	125	Nil	250	Nil	500	10
MARE20212	Dissertation I	1	4	50	50	Nil	Nil	100	200	4
MARE20-13	Green Building Rating Systems	2	2	25	25	Nil	Nil	100	150	3
MARE20214	Environmental Laws and Legislations	2	2	10	10	100	Nil	30	150	3
MARE20215	EIA and Environmental Management	1	2	10	10	80	Nil	Nil	100	2
MARE20216	Professional Training	0	4	Nil	Nil	Nil	100	Nil	100	2
MARE20217	Elective-III	1	2	25	25	Nil	Nil	50	100	2
MARE20217A	Sustainable Housing Policies									
MARE20217B	Contemporary Practices in Sustainable Architecture									
MARE20218C	Post Occupancy Evaluation									
Total		8	22	245	245	180	350	280	1300	26

List of Abbreviations

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2	**S**	Studio/Hours per week
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4	**CA2**	Continues Assessment from mid to end of semester
5	**ESE-(TH) Paper**	End semester Examination -Theory Paper
6	**ESE-(SV)**	End semester Examination -Sessional Viva
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To be implemented from 2020-21
Teaching and Evaluation Scheme (2020-2021)

Second Year M. Arch (Environmental)

Semester IV										
Subject Course	**Course**	**Teaching Scheme**		**Evaluation Scheme**						
		T	**S**	**CA1**	**CA2**	**ESE-Paper**	**ESE-STW**	**ESE-SV**	**Total**	**Credits**
MARE20221	Dissertation II	2	12	250	250	Nil	Nil	500	1000	20
MARE20222	Elective-IV	1	2	25	25	Nil	Nil	50	100	2
MARE20222A	Smart and Eco Cities									
MARE20222B	Sustainable Urban Conservation									
MARE20222C	Adaptive reuse and retrofit									
	Total	3	14	250	250	Nil	Nil	500	1100	22

List of Abbreviations

S.No.	Acronym	Full Form
1	**L**	Theory Lecture/Hours per week
2	**S**	Studio/Hours per week
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MGM UNIVERSITY
Jawaharlal Nehru Engineering College
Curriculum framework

First Year- Master of Architecture (Environmental)

Semester I

Course Detailing
1st Year - Semester I

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Subject Name: Climate Responsive Design Studio							**Semester-I**	
Subject Code: MARE20-111								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
1	6	125	125	NIL	250	NIL	500	10

COURSE OBJECTIVE (CO):

To document & analyze climate at micro & macro level to derive climate- specific design priorities & learn to implement passive design strategies for a specific climate typology.

COURSE OUTCOMES:

Students should be able interpret climate of a place & derive climate-specific design priorities to design small & large scale-built spaces.

COURSE CONTENTS:

The climate responsive design studio focuses upon understanding the relationship between thermal conditions of a built space & the external climate conditions and how they both affect thermal comfort. It aims to explore the multi-layered process of recording climate data & using climate as well as thermal comfort analysis tools to evolve / derive design considerations / parameters at site and building level. Emphasis shall be given on how well the climate data is being interpreted as well as understanding the 'perception of comfort' in a specific climate typology to arrive upon a suitable 'Approach' for designing climate-responsive spaces.

- One major and minor projects can be taken as project in this semester to understand the application very clearly at different scales and varied projects.
- One minor design problem focusing on a small-scale project such as bungalow, a small office etc. to understand basics of building level strategies for climate responsive buildings.
- One major design problem focusing on a large-scale project such as IT park; commercial complex, school or any other campus design to understand site level strategies in detail.

COURSE ASSESSMENT DETAILS:

Continuous assessment needs to be done through Case studies, continuous guidance and juries which can be considered for CA I and CAII.

End semester shall have external Viva examination.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

1) O.H.Koenigsberger; Manual of Tropical Housing & Building, University Press
2) G.K.Brown and Mark DeKay ; Sun,Wind and Light, John Wiley and Sons, INC
3) Arvind Krishnan: Climate Responsive Architecture
4) Bansal. N; Passive building design, London
5) Givoni; Man, Climate and Architecture
6) Heating Cooling Lighting- By Norbert Lechner

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Subject Name: Building Physics -I							**Semester-I**	
Subject Code: MARE20-112								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE Paper	ESE SV	ESE STW	Total	Credits
2	4	25	25	100	Nil	50	200	4

COURSE OBJECTIVE (CO):

To document, observe & analyze climate variables & thermal comfort parameters to develop a **climate-responsive design approach**.

COURSE OUTCOME:

Students should be able to document, read & interpret climate as well as comfort conditions for a specific climate-type & learn the applicability of passive design strategies in different climate contexts.

COURSE CONTENTS:

MODULE I: UNDERSTANDING & DOCUMENTING CLIMATE

- Differentiating between weather & climate; highlighting climatology as a separate field of study
- Earth-Sun Relationship [Solstices & Equinoxes, Cosine Law]; Global Climate; Macro-climate
- Climate Classification Systems
- Learning to record various elements of climate, Learning basic tools of climate variables' documentation such as Mahoney Tables etc
- Learning to read & use Sun-path diagrams & calculations of shadow angles

MODULE II: UNDERSTANDING THERMAL COMFORT

- Understanding human comfort perception
- Understanding thermal comfort factors
- Deciphering the inter-relation between D.B.T & R.H via Psychrometric chart; denoting the comfort zone on the chart [Evolving climatic design priorities]
- Co-relation of climatic data to thermal comfort by using various comfort scales [E.T Nomograms, C.E.T Nomograms, Bio-Climatic chart]

MODULE III: CLIMATE – RESPONSIVE DESIGN CONSIDERATIONS

- Understanding heat exchange through the building envelope
- Micro- climate Analysis
- Categorizing aspects of design considerations under different hierarchies [Site planning, building zoning, envelope design, building materials used] & evolving climatic design priorities

MODULE IV: PASSIVE DESIGN STRATEGIES

- Aspects of passive heating strategies [Direct gain, indirect gain, Sunspaces]
- Aspects of passive cooling strategies [Night flush cooling, comfort ventilation, evaporative cooling, earth coupling etc.]

COURSE ASSESSMENT DETAILS:

Comparative study of different climate zones along with respective case studies; exercises related to different modules to derive design strategies can be a part of continuous assessment.

Class test also can be conducted for CA; External sessional examination and a theory examination in the form of paper at END of the semester.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

1) O. H. Koenigsberger; Manual of Tropical Housing & Building, University Press
2) G. K. Brown and Mark DeKay ; Sun, Wind and Light, John Wiley and Sons, INC
3) Arvind Krishnan: Climate Responsive Architecture
4) Bansal. N; Passive building design, London
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Subject Name: Green Building Materials & Construction Technologies							**Semester-I**	
Subject Code: MARE20-113								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credit
2	2	25	25	100	Nil	Nil	150	3

COURSE OBJECTIVE (CO):

To impart knowledge about green building materials and green technologies in order to reduce direct or indirect impact of construction on the environment.

COURSE OUTCOME:

To equip the students with a value system for selecting environmentally preferable materials & technologies and to have an understanding of green building materials & technologies.

COURSE CONTENTS

MODULE I: FUNDAMENTALS:

- Embodied energy; Life cycle analysis of materials; Different approaches of studying Life Cycle; Recycling and reuse; Carbon crediting.

MODULE II: GREEN BUILDING MATERIALS:

- Introduction to green building materials, qualities, use, examples - Natural building materials, locally available and locally manufactured materials, biomaterials - Salvaged and recycled materials - Nontoxic materials: low VOC paints, coating and adhesives.
- Study of physical properties, composition, manufacturing process, Life Cycle etc. of the various green building materials i.e. Structural materials; Thermal insulation materials; Roofing materials; flooring materials etc.

MODULE III: INNOVATIVE AND ALTERNATIVE GREEN BUILDING MATERIALS:

-Innovative use of materials: Use of waste materials such as paper, glass bottles, tires, shipping containers - Use of post-consumer and industrial waste such as fly-ash, bags, building demolition waste – use of salvaged materials from flooring, columns, beams, timber, glass, etc.

- Alternative materials developed and promoted by government organizations CSIR labs: CBRI and SERC, ASTRA (IISc), BMTPC, HUDCO and its building centers

- Alternative materials developed and promoted by non-government organizations like DA, Auroville, TERI

MODULE IV: GREEN BUILDING TECHNOLOGIES:

-Material and technology role in IGBC, LEED and other rating systems.

- Vernacular materials & methods with today's technology

- Alternative construction techniques such as SMB, CSEB, and steam cured blocks, composite walls, beam and panel, funicular shells, filler slabs, reinforced concrete masonry, vaulted roofs, Ferro-cement walls etc., -explore different techniques through case studies.

COURSE ASSESSMENT DETAILS:

For continuous Assessment I & II, assignments based on all the above modules will be conducted.

End semester Theory Paper based on all the modules.

Course Reference Material

1. Sustainable Building - Design Manual Pt 1 & 2, The Energy and Resources Institute, TERI, 2004
2. Ross Spiegel.G, Green Building Materials A Guide to Product Selection and Specification, 3rd Edition by, John Wiley & Sons, 2010
3. Jagadish. K.S. Alternative Building Materials and Technologies, New age International Pvt Ltd Publishers, 2008
4. Traci Rose Rider, Stacy Glass, Jessica McNaughton, Understanding Green Building Materials, W.W.Norton and Company, 2011
5. Johan van Lengen, The Barefoot Architect: A Handbook for Green Building, Shelter Publication, 2008
6. Ross, S. and Dru, M., “Green Building Materials: A Guide to Product Selection and Specification”, John Wiley and Sons.2012

7. Ari, M., “LEED Materials: A Resource Guide to Green Building”, Princeton Architectural Press.2010
8. Tom, W. and Sam, K., “Green Building Handbook: Volume 2: A Guide to Building Products and their Impact on the Environment”, Volume 2, Taylor & Francis.2003
9. BMTPC, “Production of Cost effective, Environment Friendly and Energy efficient Building Components”, BMTPC and Ministry of Housing & Urban Poverty Alleviation, Govt. of India.2009
10. Spence, W. “Construction Materials, Methods, and Techniques: Building for a Sustainable Future”, Delmar Publications.
11. Schwartz, MM (2006) New materials, processes and methods technology. Taylor & Francis/CRC Press.
12. Watson Donald (2000) Time saver standards for building materials and systems. McGraw Hill, NY.

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Subject Name: Energy Management							**Semester-I**	
Subject Code: MARE20-114								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
2	2	25	25	Nil	Nil	100	150	3

COURSE OBJECTIVE (CO):

To introduce 'energy' as a resource, document the various ways of harnessing renewable energy sources & develop understanding regarding its management.

COURSE OUTCOMES:

- Students should be able to work out calculations to implement various energy harnessing resources at different hierarchies.
- Students should be able to analyze the feasibility as well as potential of using a certain resource for a specific context.
- Students should be well versed with energy conservation codes at building level.

COURSE CONTENTS:

MODULE I: GLOBAL ENERGY SCENARIO

- Overview of world energy scenario
- Overview of India's energy scenario
- Energy auditing & its components; energy audit types

MODULE II: NON-RENEWABLE & RENEWABLE ENERGY SOURCES (GENERATION- STORAGE- DISTRIBUTION TECHNOLOGIES)

- Classification of non-renewable & renewable energy sources; Environmental concerns of energy generation through non-renewable sources
- Harnessing & quantification of various renewable energy sources [Sun, wind, water, biomass, geo-thermal energy] to convert, store and distribute energy produced from the same at site as well as building level. Thumb rule calculations for determining input/output; Potential mapping of resources at different hierarchies

- Case studies in co-generation & hybrid systems of energy generation
- Case studies in innovative use of resource/s at different hierarchies [Site level, building level]

MODULE III: ENERGY CONSERVATION BUILDING CODES & ENERGY MANAGEMENT

- Studying minimum energy requirements w.r.t achieving an energy- efficient built space; Energy performance Index (E.P.I); Compliance requirements etc
- Energy management w.r.t the sustainable development goals
- Smart Energy Management (SEM) principles
- MNRE (Ministry of New & Renewable Energy) Policies

COURSE ASSESSMENT DETAILS:

- Literature / live case studies of renewable energy harnessing in Indian scenario
- Learning application of innovative energy harnessing solutions in live projects
- Discourses on energy conservation in today's context & writing reviews on the same

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

1. Turner and Doty; *Energy Management Handbook.*

2. Martin Greenwald; *Residential energy systems and climate control technology.*

3. Jan Kreider; Solar heating design.

4. Hegger and Fuchsen; Energy Manual

5. Green awareness, Ferris State University.

6. Energy efficient buildings by Wagner Walter

7. The architecture of Energy by Hawkes Dean and Owets Janet

8. Energy Efficient Buildings in India by Milli Mujumdar

9. Energy Conservation Building Code (ECBC India)

10. Handbook on Energy efficiency –ASHRAE Energy Use (4 Volumes)

11. CIBSI Guide –User's Manual (U.K.)

12. Energy - Manual for college teachers (CEE publications)

13. Renewable Energy & Environment - A policy analysis for India (CEE publications)

14. Sustainable Building Design Manual-Volume I and II –TERI Publication

15. Renewable Energy and Environment - A policy analysis for India. (Publication from CEE).

16. Energy Management: W.R.Murphy, G.Mckay (Butterworths).

17. Energy Management Principles: C.B.Smith (Pergamon Press).

18. Efficient Use of Energy : I.G.C.Dryden (Butterworth Scientific)

19. Energy Economics -A.V.Desai (Wieley Eastern)

20. Industrial Energy Conservation : D.A. Reay (Pergammon Press)

21. Energy Management Handbook – W.C. Turner (John Wiley and Sons, A Wiley Interscience Publication)

22. Industrial Energy Management and Utilization – L.C. Witte, P.S. Schmidt, D.R. Brown (Hemisphere Publication, Washington)

23. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982

24. Energy Conservation guide book Patrick/Patrick/Fardo (Prentice Hall)

MAHATMA GANDHI MISSION
MGM UNIVERSITY, AURANGABAD
Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

Subject Name: Building Simulation Software							**Semester-I**	
Subject Code: MARE20-115								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE STW	Total	Credit
0	4	25	25	Nil	Nil	50	100	2

COURSE OBJECTIVE (CO):

To learn different computer aided tools to understand how building performance acts in response to elements of climate.

COURSE OUTCOME:

Students should explore environmental simulation software like Ecotect, Design Builder and IES etc. Different exercises related to environmental analysis of buildings are expected.

COURSE CONTENTS

The software skills shall be used for various applications like lighting, thermal comfort of spaces, energy calculations along with other parameters like climate, material selection and shadow analysis. Al so overall internet and cyber security will be introduced to the students as part of the curriculum.

MODULE I: INTRODUCTION TO ALL THE COMPUTER AIDED SOFTWARES

1. All the software related to climatic analysis (Climate consultant, wind simulator, Rhino grasshopper, shadow analysis software)
2. Overview of all Energy Simulation Software. ECOTECT, HEED, Energy 10, Design Builder, EQUEST, DOE-2, Green Building Studio, IES VE, Energy Plus, Energy Plus-SketchUp Plugin.

MODULE II: ENERGY SIMULATION SOFTWARE.

1. Hands-on experience of modeling in the software along with introductory parameters and their studies like: Climatic analysis, shadow analysis, material selection etc
2. Lighting: Calculations and inferences for day lighting and application of artificial lighting along with its analysis

3. Thermal Comfort: Calculations for thermal comfort of spaces and its associated parameters like heat gains-losses, temperature profiles, fabric gains-losses, ventilation etc
4. Energy Usage: Calculation for energy usage of the building.

Report with individual exercises for various parameters of the taught software as per break-up of module.

COURSE ASSESSMENT DETAILS:

Continuous assessment needs to be done through application-based assignments related to modules.

End semester will have external sessional term work assessment.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

1. Clarke J. (2001) Energy Simulation in Building Design, 2nd Edition. Oxford: Butterworth-Heinemann.

2. Clarke JA., Yaneske PP. and Pinney AA. (1990) The Harmonisation of Thermal Properties of Building Materials BRE Publication & BEPAC Research Report.

3. CIBSE (2006) Guide A: Environmental Design, London: Chartered Institution of Building Services Engineers.

4. Help Manuals related to software.

5. Video Tutorials related to software.

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To be implemented from 2020-21

Subject Name: Ecology and Environment							**Semester-I**	
Subject Code: MARE20-116								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credit
2	0	10	10	80	Nil	Nil	100	2

COURSE OBJECTIVE (CO):

The objective of this course is to understand the Ecological and Environmental systems, its importance and interdependence on each other.

COURSE OUTCOME:

-To understand ecology, climate and different elements of environment which we need to preserve.

-To understand different issues related to environment so as students can give solutions to the impacts.

-To understand development of different policies or strategies at different levels.

COURSE CONTENTS

MODULE I: ECOLOGY AND BIODIVERSITY

1. Concept of Ecosystem, Type of Ecosystems, Components of ecosystem, Earth Biomes, Climate Zones
2. Linkages and the cyclic flow of materials and energy. Biotic and abiotic components of an Ecosystem
3. Introduction to the concepts of Biodiversity,

MODULE II: HUMAN INTERACTION WITH ECOLOGY AND ENVIRONMENT

1. Human interventions and ecosystem disturbances, impacts of human activities on natural resources and biodiversity, changing of the ecosystem cycles etc.
2. Local, regional and global impacts on the Environment. Introduction to Air, water, land pollution; introduction to wasteland creation & barren land formation, soil erosion at regional level.

3. Introduction to global environmental issues like Climate Change, Desertification, Global Warming, Ozone Depletion, Acid Rain etc.

MODULE III: ECO-SYSTEM PRESERVATION AND SITE DEVELOPMENT

1. Methods of ecosystem preservation by Development of sites/ land in accordance to their environmental properties. Recognizing environmental quality and deciding potential of Environmental planning at the site level; Eco friendly techniques for increasing land potential.
2. Preservation and protection of important sensitive areas, Concept of Rehabilitation of degraded sites, Environmental clearance Reports

COURSE ASSESSMENT DETAILS:

Continuous assessment needs to be done through application-based assignments related to modules.

End semester Theory Paper based on all the modules.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- *Cever Francisco a: Elements of landscape world of environment.*
- *Mukherjee Pippa: Nature Guides Common Trees Of India. Worldwide Fund For Nature*
- *Papanek Victor: Green Imperative Ecology*
- *Ethics In Design. Thames And Hudson*
- *Randhawa M S: Flowering Trees. India*
- *Environmental analysis for land use and site planning. By Marsh Williams M. (MC Grew hill (1978)*
- *Climate Change and Biodiversity-Edited by Thomas Lovejoy and Lee Hannah-TERI publication*
- *Landscape Planning and Environmental Applications-By M.W.Marsh*
- *River Ecology-by Prakash Gole*

MAHATMA GANDHI MISSION
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Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

Subject Name: Elective-I: Dynamic Facades							**Semester-I**	
Subject Code: MARE20-117A								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

To learn the specifics of dynamic / adaptive building envelopes to design a façade for a specific climate type & a building type.

COURSE OUTCOMES:

Students shall not only learn the components of dynamic facades but also try to establish the relation between work-place productivity & façade design through literature & live case studies.

COURSE CONTENTS:

MODULE I: DYNAMIC FACADES CONCEPT

- Understanding the concept of adaptive building envelopes & its many names
- Role of the building façade; key features of adaptive building facades
- Historical evolution of intelligent building envelope

MODULE II: DESIGNING DYNAMIC FACADES

- Parameters for designing dynamic facades
- Responsive building elements [Integrated facades; Bio-climatic Self Active skins; Dynamic Insulation systems; Thermal Mass activation etc.]
- Case studies in dynamic facades

COURSE ASSESSMENT DETAILS:

- Assignments can be decided based on modules which can have a practical approach to responsive façade; Comparative study of various types of responsive facades along with Designing an adaptable façade for a small-scale built space.

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COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Kinetic Architecture: Designs for Active Envelopes- By Russell Fort Meyer, Charles Linn
- Sustainable Facades: Design Methods for High-Performance Building Envelopes- By Ajla Aksamija
- Bioclimatic Double-Skin Façades- By Mary Benedict Bonham
- Intelligent glass façades: material, practice, design- By Andrea Compagno

MAHATMA GANDHI MISSION
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Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

Subject Name: Elective-I: Disaster Management & Mitigation							**Semester-I**	
Subject Code: MARE20-117B								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

-To develop understanding of Natural and Man-made disasters in the context of increasing urban development to examine the inter-relations between environment, development & disasters.

-The course structure also focuses on the Challenges and opportunities through Mitigation, Preparedness, Response, Recovery and Humanitarian responses.

-To develop understanding of the existing mechanisms for disaster management & examine the shortcomings in the same.

COURSE OUTCOME:

The course develops the understanding and knowledge in the field of Disaster mitigation and Management. It also develops the procedure which will help students to critically analyse the key concepts of Urban Disaster management theory, Research, Policy and Practices by Local authorities.

COURSE CONTENTS:

MODULE – I: INTRODUCTION TO DISASTER & URBAN DEVELOPMENT

- Defining Disaster, Defining Development: Discourse on inter-relations between development, Environment and Disaster
- Introduction to types of Disaster with reference to Urban Development
- Natural and Human Induced Disasters- Meaning and nature of disasters, their types and effects
- Disaster Determinants: Type of damage, Habitation pattern, Physiology and Climate consideration; Analysis

MODULE – II: DISASTER MANAGEMENT – PREPAREDNESS, RESPONSES AND RECOVERY

- **Preparedness:** Concept and Nature, Disaster Preparedness Plan, Prediction, Early warnings and safety measures to be taken, Understanding the role of Government authorities and NGO's support
- **Responses**: Disaster response plan, Communication, Participation and Activation of Emergency plan, Search-Rescue-Evacuation and Logistic management, Psychological response and management
- **Rehabilitation, Reconstruction and Recovery**: Reconstruction and Rehabilitation as a means of Development
- Guidelines for Disaster resistant construction, traditional techniques, Seismic strengthening of houses in low rain/High rainfall area, earthquake resistant construction technique.
- Study of the Govt. policies to deal with all types of the disasters.
- Disaster management mechanism - At National, State and District levels
- Study of Disaster Management Act.2005
- Sustainable practices for disaster management

MODULE – III: DISASTER MITIGATION

- Factors affecting the Mitigation
- Risk and Vulnerability Analysis: Concept, Strategic development for the Vulnerability reduction.
- Sustainable practices for disaster mitigation.

COURSE ASSESSMENT DETAILS:

Students shall select a disaster that has happened in the past & analyse the probable causes, effect, preparedness & response w.r.t the selected disaster in Urban development.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Dr. Mrinalini Pandey Disaster Management Wiley India Pvt. Ltd.
- Tushar Bhattacharya Disaster Science and Management McGraw Hill Education (India) Pvt. Ltd.
- Jagbir Singh Disaster Management: Future Challenges and Opportunities K W Publishers Pvt.
- J. P. Singhal Disaster Management Laxmi Publications.
- Shailesh Shukla, Shamna Hussain Biodiversity, Env and Disaster Management Unique Pbln.

- C. K. Rajan, Navale Pandharinath Earth and Atmospheric Disaster Management: Nature and Manmade B S Publication
- Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge
- Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Program (2009-2012).
- Disaster Management Act.2005, NDMA Policy Document

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Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

Subject Name: Elective-I: Urban Public Spaces							**Semester-I**	
Subject Code: MARE20-117C								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

To study the social, cultural & political connotations of public spaces to derive the process of designing sustainable urban public spaces.

COURSE OUTCOME:

Through literature / live cases, the elective shall focus upon the process that needs to follow to design accessible, convenient, attractive, interactive, safe, sustainable & inclusive public spaces.

COURSE CONTENTS:

MODULE – I: UNDERSTANDING THE TERM 'PUBLIC' & ITS UNDERLYING ASPECTS:

Defining 'urban public realm'; debates & discourses on the term 'public'

- Social, cultural, economic, environmental & political facets of public spaces in Indian cities
- Discussions on 'sense of place' & 'what creates a good place'

MODULE II: BRIEF HISTORY OF TRADITIONAL PUBLIC SPACES: DESIGN TAKEAWAYS

- Planning of public spaces in Historical and Traditional cities; Their characteristics and relationship with other Land uses
- Discussions on the characteristics of temple complexes, kunds, lake precincts, ghats, bazaars, streets, chowks etc w.r.t their linkages with other land-uses, designing & activities taking place.
- Discussions on 'sense of place' & 'what creates a good place'
-

MODULE III: PLANNING, DESIGN & MANAGEMENT OF PUBLIC SPACES: THE PROCESS

- Understanding 'Placemaking' as an approach to planning & designing public spaces
- Elements of placemaking
- Tools of placemaking

Course Assessment Details:

- Literature case studies w.r.t traditional public spaces
- Literature / live case studies of designed urban public spaces in today's context

Course Reference Material (Recommended Readings)

- The Death and Life of Great American Cities- By Jane Jacobs
- Public Places - Urban Spaces: The Dimensions of Urban Design- By Matthew Carmona, Tim Heath, Taner Oc, Steve Tiesdell
- Cities For People- By Jan Gehl
- The Wayfinding Handbook: Information Design for Public Places- By David Gibson
- The Street: A Quintessential Social Public Space- By Vikas Mehta

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To be implemented from 2020-21

MGM UNIVERSITY
Jawaharlal Nehru Engineering College
Curriculum framework

First Year- Master of Architecture (Environmental)

Semester II

MAHATMA GANDHI MISSION
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Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

Subject Name: Energy Efficient Design Studio							**Semester-II**	
Subject Code: MARE20-121								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credit
1	6	125	125	Nil	250	Nil	500	10

COURSE OBJECTIVE (CO):

To understand the application of energy efficiency strategies to be implemented from designing to retrofitting of buildings.

COURSE OUTCOME:

Understanding energy management of buildings as per the activities in buildings so as to reduce the energy consumption through climate responsive strategies.

COURSE CONTENTS

Design/Retrofitting of buildings/campuses for energy efficiency. Focus should be on buildings/campuses which are conventionally energy consumers. critical study and application of concepts and strategies at input and output of energy use. Calculations and quantitative supplementing of all strategies at different levels.

- Built elements level (façade, openings, materials, etc.) – planning stage
- Energy management level – operational stage
- Technology level - operations and maintenance stage.

Retrofitting of a medium-scale commercial project in detail or Design of medium scale building project in lieu of energy efficient building design. Ex Commercial complex, Hotels, Hospitals, etc.

COURSE ASSESSMENT DETAILS:

Continuous assessment should be done on regular intervals and through case studies and juries.

Minimum one design or retrofitting project for External End semester viva examination.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

1. Givoni, B (1994) Passive and low energy cooling of buildings, Van Nostrand Reinhold Co.

2. Markus, TA & Morris, EN (1980) Building, Climate and Energy, Pitman Publishing Limited, London.

3. Green Architecture, Design for a sustainable future

4. Energy efficient buildings by Wagner Walter

5. Energy Efficient Buildings in India by Milli Mujumdar

6. Energy Conservation Building Code (ECBC India)

7. Handbook on Energy efficiency –ASHRAE Energy Use (4 Volumes)

8. CIBSI Guide –User's Manual (U.K.)

9. Energy Management: W. R. Murphy, G. Mckay Butterworths).

10. Energy Conservation guidebook Patrick/Patrick/ Fardo (Prentice Hall)

11. Energy efficient buildings in India by Mili Mujumdar. (Teri)

MAHATMA GANDHI MISSION
MGM UNIVERSITY, AURANGABAD
Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

Subject Name: Building Physics -II							**Semester-II**	
Subject Code: MARE20-122								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
2	4	25	25	100	NIL	50	200	4

COURSE OBJECTIVE (CO):

To examine, document & interpret lighting & ventilation conditions of functionally diverse built spaces to achieve climatically efficient conditions w.r.t the same & explore their designing possibilities.

LEARNING OUTCOMES:

- Students are expected to analyze live conditions in a built space & derive design parameter for creating efficient visual environment.
- Students are expected to analyze & interpret effects of built form on natural ventilation.

COURSE CONTENTS:

MODULE I: NATURAL VENTILATION & BUILT ENVIRONMENT

- Driving forces of natural ventilation; challenges in designing for naturally ventilated spaces
- Understanding air flow around buildings & the factors affecting it [orientation; external features; size & location of openings; fenestration design etc.]
- Understanding temperature-induced air movement [Stack ventilation working & design aspects]
- Understanding wind-induced air movement [Cross ventilation working & design aspects; single-sided ventilation]
- Ventilation rate standards

MODULE II: DAYLIGHTING

- Sources of daylight; understanding usable daylight / daylight availability; Photometric quantities; daylight factor concept
- Understanding visual comfort factors [Illuminance, Distribution, Glare etc.]; Measurement & analysis of daylight

- Advanced daylighting Systems

MODULE III: ARTIFICIAL LIGHTING

- Classification of Light sources & ballast systems; Luminaries and light distribution
- Lighting controls; building level controls & integration with daylight
- Software for artificial lighting simulation [Dilux, etc]

COURSE ASSESSMENT DETAILS:

One major assignment on day-lighting assessment & one major assignment on ventilation calculations.

Continuous assessment should be done on regular intervals through case studies and juries etc

External End semester sessional examination.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

1. Manual of Tropical housing and climate by *Koenisberger*.

2. Climate responsive architecture by *Arvind Krishnan*

3. Manual of solar passive architecture - by *Nayak J.K. R. Hazra J. Prajapati.*

4. Sun Wind and Light-Architecture Design Strategies-by *G.Z.Brown and Mark Dekay*

8. Day Light in Architecture by *Benjamin H.Evans,AIA*

9. Day lighting Design and Analysis by *Claude L.Robbins*

10. The Lit Environment – by *Derek Phillips*

MAHATMA GANDHI MISSION
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Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

Subject Name: Sustainable Development & Planning							**Semester-II**	
Subject Code: MARE20-123								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
2	4	25	25	100	NIL	50	200	4

COURSE OBJECTIVE (CO):

To facilitate the debate on sustainable city development to develop understanding regarding the aspects that create a livable, safe, healthy & inclusive city.

COURSE OUTCOME:

Students are expected to develop understanding of the aspects for sustainable city planning & learn emerging concepts such as mixed land use zoning, transit-oriented development etc.

COURSE CONTENTS:

MODULE I: DISCOURSES ON SUSTAINABILITY & DEVELOPMENT

- Readings on the report 'Limits to growth 'to highlight the relationship between pollution, growth, resources, population & industrialization
- Understanding economic & social aspects of sustainability & development
- Debates on current development trends in Indian cities & its effects on the 'people' & the 'place'

MODULE II: CITY PLANNING & GOVERNANCE

- Emergence of Modernist Planning approach & its problems; History of urban planning in India.
- Sustainable Urban Planning principles; New urban forms [New Urbanism, compact city]
- Sustainable transit approaches & Transit-Oriented Development
- Planning & governance; Social Planning & social policy
- Aspects of participatory urban planning; Planning approach for the urban informal sector

MODULE III: ROLE OF URBAN DESIGN & NEIGHBORHOOD PLANNING

- Understanding the 'human' dimension of city planning [Social aspects of sustainability]; understanding the role of urban design in creating safe, lively & inclusive spaces

- History of neighbourhood planning; efficient neighbourhood planning aspects [Walkability, mixed land-use, street design, community space design etc]

MODULE IV: SUSTAINABILITY IN THE HOUSING CONTEXT

- Housing scenario in Indian cities; understanding the economical & social context of housing
- Understanding 'Affordability 'in the context of housing

COURSE ASSESSMENT DETAILS:

- Book reviews & formal debates w.r.t modules contents
- Literature case studies w.r.t cases having implemented TOD, mixed-use zoning
- Literature case study on urban design projects of India

Continuous assessment should be done on regular intervals through case studies and juries etc.

External End semester sessional examination.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

1) Smart Urban & Rural Planning Techniques - By *Harmit Singh Bedi*
2) India's Urban Confusion – By *Dr. M. Ramachandran*
3) Local Area Planning in India- By *Rishi Dev*
4) Designing Community – By *David Walters*
5) Design First: Design-based planning for community – By *David Walters*
6) Ethics & Urban Design – By *Gideon. S. Golany*
7) The Architecture of Urban Design – By *Josep Lluis Sert*
8) City Design – By *Jonathan Barnett*
9) City Edge – By *Esther Charlesworth*

MAHATMA GANDHI MISSION
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To be implemented from 2020-21

Subject Name: Building Services and Management							**Semester-II**	
Subject Code: MARE20-124								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credit
2	2	25	25	100	Nil	Nil	150	3

COURSE OBJECTIVE (CO):

To provide a comprehensive understanding of building service management from environmental perspective.

COURSE OUTCOME:

- To understand different Mechanical ventilation systems to achieve comfort with energy efficiency.
- To understand and manage water as a resource efficiently.
- Detail study of waste management to understand different ways of handling waste.

COURSE CONTENTS

MODULE I: ENERGY EFFICIENT HVAC SYSTEMS

-Air Cycle, Refrigerant cycle, Basics of Cooling load estimation. Types of systems to include unitary, central, CAV, VAC, VRF etc. air cooled, water cooled, and ducting design. Air conditioning system, and components. Energy conservation measures and technologies.

MODULE II: WATER MANAGEMENT

-Introduction, water demand, growing water misuse, pollution, threat to environment, social implications, and sustainability of water recourses, ground water management, and issues related to urban water supply.

-Quality and quantity standards for water; R.O. system for potable water.

-Storm water system; Rainwater harvesting, Measures for effective water management in Buildings; net zero water approach

MODULE III: WASTE MANAGEMENT

- Identify and discuss the public health, regulatory, planning, technical principles that influence the solid waste management system, electronic waste, industrial waste, medical waste and C&D (construction and demolition) waste etc.
- Analysis of an integrated solid waste handling system including source reduction, recycling and reuse, composting, land filling and combustion.
- Sustainable techniques in solid waste management and others: Introduction, Segregation, Sorting, Composting, Vermi composting, Home composting, Recycling and Reuse, Incineration method, Scientific Land filling, Energy development and Management of urban waste services.

MODULE IV: BUILDING MANAGEMENT

And overview of software related to Building Management, BIM or Building Energy Management Systems (BEMS) Building Automation Systems (BAS), Office automation System (OAS), Communication automation System (CAS) and Computer Aided Facility Management System (CAFMS)

COURSE ASSESSMENT DETAILS:

Continuous assessment needs to be done through application-based assignments related to modules.

End semester Theory Paper will have all the modules.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Design for Water | Rainwater Harvesting, Storm water Catchment, and Alternate Water Reuse, Author: Heather Kinkade-Levario.
- DEWATS, Auroville.
- Water Sensitive Urban Design: Principles and Inspirations for Sustainable Stormwater Management in the City of the Future, By Jacqueline Hoyer, Wolfgang Dickhaut, Lukas Kronawitter, Björn Weber.
- Turner and Doty; *Energy Management Handbook.*
- Martin Greenwald; *Residential energy systems and climate control technology.*
- Jan Kreider; *Solar heating design*.
- *Green awareness*, Ferris State University.
- Banham, R (1969) Architecture of the Well Tempered Environment, Architectural Press.
- Boutet, TS (1987) Controlling air movement, McGraw Hill Book Co.
- Brookes, A & Grech, C (1992) The Building Envelope, Butterworth Architecture.
- Clements-Croome, D (2004) Intelligent Buildings: Design, Management & Operation, Thomas Telford.
- Wang, S (2010) Intelligent buildings and building automation. Spon Press.

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Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

Subject Name: Research Methodology							**Semester-II**	
Subject Code: MARE20-125								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credit
2	2	20	20	50	Nil	60	150	3

COURSE OBJECTIVE (CO):

To imbibe the importance of research in architecture and enable the students to undertake methodical research in an area of their interest.

COURSE OUTCOMES: The students shall develop the skill to identify and decipher issues relating to Architecture based on research methods and its application.

Students undertake methodical research and report in form of a research paper

COURSE CONTENTS

MODULE I: FUNDAMENTALS OF RESEARCH

1. Introduction to the types and methods of research their relative advantages and disadvantages, the process of formulating a research.
2. Components of Research Process and Methodology: problem statement, literature review, critical thinking (analysis and inferences), types of hypothesis, types of sample, methods of data collection, data analysis, research proposal preparation. Types of variables and their measures.
3. Ethics in research and publication ethics.
4. Introduction to technical writing and presenting a research paper.

MODULE II: RESEARCH IN ARCHITECTURE

1. Introduction of Research & its importance in Architecture. Need based Research Areas, its Identification. Defining Scope and Limitations.
2. Qualitative, Quantitative and Mixed methods approach in architectural research.
3. Research proposal preparation, research outcome.

MODULE III: RESEARCH DATA SAMPLING AND ANALYSIS METHODS

1. Introduction to the concept of Normal distribution.

2. Sampling Techniques: Probability and Nonprobability sampling, sampling errors.

Use of statistics in research. Central tendencies, introduction to correlation, association and regression. Type 1 and type 2 errors in hypothesis testing.

Student should be able to complete a research paper draft in the semester and it should be ready for the publication. Research topic can be Based upon any of the knowledge domains studied by the student in the curriculum.

COURSE ASSESSMENT DETAILS:

Continuous assessment needs to be done through application-based assignments related to modules. One research paper should be ready by the end of semester along with its plagiarism report.

End semester term work should include assignments like study review, formulation of research topic and research paper.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Graziano, A (1989) Research methods process of inquiry, Harper Collins Publishing, New York.
- Dwivedi, RS (2001) Research Methods in behavioural science, Mcmillan, New Delhi.
- Groat, L & Wang, D (2002) Architectural research methods, John Wiley publication, New York.
- Harrigan, JE (1987) Human factors research methods, Elsevier, Amsterdam.
- Kothari, CR (1990) Research Methodology: methods & techniques, Wishwa Prakashan, New Delhi.
- Sanhoff, H (1991) Visual research methods in design, Van Nostrand Reinhold, New York.
- Zeisel, J (1995) Inquiry by Design: tools for environment-behaviour research, Cambridge University Press.
- Creswell, JW (2002) Research design: qualitative, quantitative, & mixed methods approach. Thousand Oaks, Sage.
- Denscombe, M (2003) The good research guide: for small-scale research projects. Oxford University Press, London.
- George, A & Bennett, A (2005) Case studies and theory development in the social sciences. Cambridge MA: MIT Press.

MAHATMA GANDHI MISSION
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To be implemented from 2020-21

Subject Name: Elective-II: GIS and Terrain Mapping							**Semester-II**	
Subject Code: MARE20-126A								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

To understand Survey of modelling tools for getting information at neighbourhood or city level.

COURSE OUTCOMES:

The course will make student understand and represent the Geological, environmental urban level data using GIS or terrain mapping as a tool.

COURSE CONTENTS:

MODULE I: INTRODUCTION TO DIFFERENT TERRAIN MAPPING TECHNIQUES.

- Introduction to Geographic Information System and many other terrain mapping techniques.
- GIS Techniques & technology. Basic concepts in GIS and CAD/GIS data interchange techniques, creating a contoured base-map, developing a surface model, developing a slope map, aspect map.
- Relating information from different sources, map projections, CAD drawings,

MODULE II: APPLICATION AND USE OF GIS

- Site selection, Geo processing, Generating queries,
- Data representation: Raster – Vector. Data capture. Spatial analysis, Data modelling, map overlay, geological information, terrain analysis.
- Case Studies – Urban Planning, Network Analysis etc.

COURSE ASSESSMENT DETAILS:

Continuous assessment needs to be done through application-based assignments related to modules.

End term External sessional assessment based on the assignments done w.r.t the above modules.

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COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Berry, J. K. (1993). *Beyond Mapping: Concepts, Algorithms and Issues in GIS*. Fort Collins, CO: GIS World Books.
- Bolstad, P. (2005). *GIS Fundamentals: A first text on Geographic Information Systems, Second Edition*. White Bear Lake, MN: Eider Press, 543 pp.
- Burrough, P. A. and McDonnell, R. A. (1998). *Principles of geographical information systems*. Oxford University Press, Oxford, 327 pp.
- Chang, K. (2007). *Introduction to Geographic Information System, 4th Edition*. McGraw Hill, ISBN 978-0071267588
- Elangovan, K. (2006). "GIS: Fundamentals, Applications and Implementations", New India Publishing Agency, New Delhi" 208 pp.
- Fu, P., and J. Sun (2010). *Web GIS: Principles and Applications*. ESRI Press. Redlands, CA. ISBN 1-58948-245-X.
- Harvey, Francis (2008). *A Primer of GIS, Fundamental geographic and cartographic concepts.* The Guilford Press, 31 pp.
- Heywood, I., Cornelius, S., and Carver, S. (2006). *An Introduction to Geographical Information Systems*. Prentice Hall. 3rd edition.
- Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2005). *Geographic Information Systems and Science*. Chichester: Wiley. 2nd edition.
- Maguire, D.J., Goodchild M.F., Rhind D.W. (1997). "Geographic Information Systems: principles, and applications" Longman Scientific and Technical, Harlow.
- Ott, T. and Swiaczny, F. (2001) .*Time-integrative GIS. Management and analysis of spatio-temporal data*, Berlin / Heidelberg / New York: Springer.
- *Sajeevan G. (March 2008). "Latitude and longitude – A misunderstanding" (PDF). Current Science.* ***94*** *(5): 568.*
- *Sajeevan G (2006). "Customise and empower". Geospatial Today.* ***4*** *(7): 40–43.*
- Thurston, J., Poiker, T.K. and J. Patrick Moore. (2003). *Integrated Geospatial Technologies: A Guide to GPS, GIS, and Data Logging*. Hoboken, New Jersey: Wiley.
- *Roger F. Tomlinson (2007). Thinking about GIS: Geographic Information System Planning for Managers. ESRI, Inc. ISBN 978-1-58948-158-9.*

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To be implemented from 2020-21

Subject Name: Elective-II: Sustainable Transport Systems							**Semester-II**	
Subject Code: MARE20-126B								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

- The course aims at imparting knowledge on understanding of urban transportation systems. It focuses on defining the problem & setting clear objectives to serve as guiding factors in Sustainable Urban Mobility.
- The course also provides adequate exposure to formulate and evaluate policies in relation to the environmental considerations for Transportation Planning.

COURSE OUTCOMES:

- Course will equip the students with knowledge of fundamentals of planning a sustainable urban transit System. Students are expected to document & analyze different cases based on the learned principles.
- Learning shall include looking at sustainable urban transport principles & their applicability through literature / live case studies.

COURSE CONTENTS:

MODULE I: FUNDAMENTALS OF TRANSPORTATION PLANNING

- Historical perspective of road development in India; Current trends in road development; accessibility and priority index in traffic network planning; Economic, political and social significance of transport development, Transport policies in India before and after independence
- Importance of accessibility in regional transport planning.
- Role of road, rail, air and water transport systems, regional transport systems planning; road network planning for micro regions.
- Transportation planning process, Factors influencing travel demand, Travel demand modelling- Trip generation, Modal split, Trip distribution and Route assignment analyses, Transportation

surveys, Land-use models, Travel demand forecasting, Urban structure and its influence of travel intensity, Urban goods movement.

- Develop the understanding of 'Mobility' w.r.t different-sized Indian cities & throw light upon the National Urban Transport Policy, 2006.

MODULE II: TRANSPORT & ENVIRONMENT

- Mass transportation in urban environment; relation of urban form and transportation; Environmental considerations
- Traffic noise, factors affecting noise, noise abatement measures, standards.
- Air pollution standards.
- Traffic safety; Accident reporting and recording systems, factors affecting road safety.
- Transport planning for target groups- children, adults
- handicapped and women, Norms and guidelines for highway landscape

MODULE III: SUSTAINABLE TRANSIT SOLUTIONS & POLICIES

- Discussions on the issues in urban mobility would be facilitated to debate upon the way in which transport policies are formulated & what parameters need to be considered for policy formulation as per the city context.
- Review of existing national, state and local level transport policies and their relevance in spatial and economic planning, pricing and funding of transport systems
- Aspects of sustainable transit like TOD, BRTS, integrated transit, role of non-motorized transport, role of paratransit.

COURSE ASSESSMENT DETAILS:

- Case Study: Historical perspective of road development in India and other countries, Best practices from India and abroad; New innovations and concepts in Sustainable Transport Planning.
- Project: Formulation of a Sustainable Transportation system and Policy for any Urban agglomeration or Other assignments can be taken according to the need of the module and learning outcome expected by course.
- Continuous assessment needs to be done through application-based assignments related to modules.

- End term External sessional assessment based on the assignments done base on the above modules.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Adib Kanafani. (1983). Transportation Demand Analysis. Mc Graw Hill Series in Transportation, Berkeley.
- Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. Mc Graw Hill Book Company, NewYork.
- John W.Dickey. (1975). Metropolitan Transportation Planning. Mc Graw Hill Book Company, New York.
- Transportation Engineering and Planning. 3rd Edition, Prentice – Hall of India Pvt Ltd., 318-436.

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Subject Name: Elective-II: Sustainable Landscape							**Semester-II**	
Subject Code: MARE20-126C								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

Holistic understanding of sustainable landscape to preserve the landscape in site or in city and surroundings.

To develop understanding of landscape to minimize the impact due to change in landscapes.

COURSE OUTCOME:

Course will equip students to use sustainable landscape approach to handle projects from building, to campus, neighborhood to new urban development to preserve conserve or reduce the impact on environments. for

COURSE CONTENTS:

MODULE I: LANDSCAPE ECOLOGY

Introduction to Landscape ecology, Landforms and Development of landscapes,

Patterns and structure of landscapes, Functions of landscape, Concept of landscape Metrics,

Understanding dynamic interaction between landscape structure and function, Ecological services of landscape,

History of landscapes to understand the scio cultural impacts on Development through eras.

MODULE II: LANDSCAPE DESIGNING AND PLANNING

The purpose of planning and designing landscape, Principals Procedures for Designing and planning landscape,

Basics of collecting and analyzing, projecting and presenting data in landscape planning, visual assessment and aesthetic dimension,

Concepts and projects of McHarg, Carl Steinite, Warren Manning, Augus Hills, Phil Lewis – Izank Zonneveld, Ervin Zube - Landscape planning models.

MODULE III: CASE STUDIES: LANDSCAPE MANGEMENT.

Reclamation and restoration of dilapidated landscapes, Conservation and preservation of ecological fragile areas such as wetlands, creeks etc., Conservation ordinances, Policies and landscape

Landscape management at regional scale, Managements practices with emphasis on urban forest, urban ecology, river front development green belt

Regional open spaces, national parks, reserved forests, wetlands, coastal areas,

Horticultural practices

COURSE ASSESSMENT DETAILS:

- Case studies related to different landscape planning projects, live or bookcase studies.
- Discussions or article reviews for Continuous assessment can be done through application-based assignments related to modules.
- End term External sessional assessment based on the assignments done base on the above modules.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Richard T.T.Forman and Michel Godron , Landscape Ecology, John Wiley & Sons, 1986
- Tom Turner, Landscape Planning and Environmental Impact Design, UCL Press, London, 1998
- Ervin H. Zube, Robert O Brush, Julios G.Y.Fabos, Landscape assessment –values, perceptions, 1975
- G. Tyler Miller Jr., Living in the Environment: Principles, Connections, and Solutions, Brooks /Cole publisher's co., 2004
- William M. Marsh, Landscape planning – Environmental Application, John Wiley and sons Inc., 1997

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MGM UNIVERSITY

Jawaharlal Nehru Engineering College
Curriculum framework

Second Year- Master of Architecture (Environmental)

Semester III

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To be implemented from 2020-21

Subject Name: Sustainable Planning Studio							**Semester-III**	
Subject Code: MARE20-211								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE Paper	ESE SV	ESE	Total	Credit
1	6	125	125	Nil	250	Nil	500	10

COURSE OBJECTIVE (CO):

To involve the students in neighbourhood / small urban / environmental planning projects where they will be able to apply the theoretical knowledge of environmental aspects to a specific project.

COURSE OUTCOME:

After the study of all the issues related to rural or urban areas students should try to explore different solutions to address those issues.

COURSE CONTENTS

Module I: Students will do a detailed study of the development or the given areas and identify environmental issues observed in built environments and will give the proposal for the issues.

The theme of Environmental Planning applicable to small portions, which may include Riverfront development, ecological restoration projects, sustainable urban blocks, Sustainable City Development Strategies etc.

Module II: This can be done through Environmental Assessments, Environmental Status Reporting and identification of environmental issue in selected areas.

Module III: Individual / Group proposals for the identified issues as Conceptual master planning for Sustainable Development of neighborhoods, preservation of eco-sensitive areas, Small proposals for social awareness, Small sustainable design projects environmental policy level suggestions are expected from the students. etc.

COURSE ASSESSMENT DETAILS:

Continuous assessment needs to be done through the intermediate assessment in the form of presentation and Juries wherever required.

End semester external viva assessment should be done.

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COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- As recommended by faculty based on the exercise

- Kevin Lynch, *Image of the City*
- Edington John; *Ecology and Environmental Planning*
- Alexander Christopher; *A pattern Language the Environment, Public Health and Human Ecology consideration for Economic Development.*
- Antonio Layard's; *Planning for Sustainable future*
- D F arr; *Sustainable Urbanism*
- Tifiin J; *Transport communications*
- Brain; *Transportation Cities*
- *Watson, D; et al (2003) Time Saver Standards for Urban Design, McGraw Hill, New York.*

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To be implemented from 2020-21

Subject Name: Dissertation I							**Semester-III**	
Subject Code: MARE20-212								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE Paper	ESE SV	ESE	Total	Credit
1	4	50	50	Nil	Nil	100	200	4

COURSE OBJECTIVE (CO):

The course objective is to impart capability of organizing and analytically evaluating information into topics of possible research in built environment with appropriate developed literature searches. The topic of research has to be applied in research so that the application of findings can be demonstrated in the Dissertation II.

COURSE OUTCOMES:

To develop ability of reviewing literature and Reporting literature using standard methods of reporting, citations, paraphrasing.

To develop methodological framework of dissertation.

COURSE CONTENTS

- Identification of an appropriate and focused dissertation topic reflecting sustainable, environmental technological needs of the day.
- The topic can be of Planning designing based proposing policy level detailing to take out design solutions.
- Formulate proposal including objectives, scope and limitations of work, methodology of work, case studies to be undertaken.
- An in-depth investigation of the topic using an analysis of existing literature, case studies and other sources. To develop understanding of the dissertation topic.

COURSE ASSESSMENT DETAILS:

- Continuous assessment needs to be done through the intermediate assessment of literature reviews and synopsis in the form of presentation and Juries wherever required.
- End semester external term work assessment should be done.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- McMillan, K & Weyers, J (2007) How to write dissertations and project reports. Pearson Prentice Hall.
- Watson, G (1987) Writing a thesis: a guide to long essays and dissertations, London: Longman. Specialist bibliography according to the project.
- Turabian, K (2007) A manual for writers of research papers, theses, and dissertations, 7th Edition, Chicago: University of Chicago Press.
- As appropriate for each individual thesis.

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To be implemented from 2020-21

Subject Name: Green Building Rating Systems							**Semester-III**	
Subject Code: MARE20-213								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credit
2	2	25	25	Nil	Nil	100	150	3

COURSE OBJECTIVE (CO):

To explore the different assessment patterns for designing and rating the green buildings.

COURSE OUTCOME:

To understand the existing global and national level rating systems in detail.

COURSE CONTENTS:

Module I: Global green building rating movement.

Evolution of global green movement, Introduction to global rating systems (BREAM, LEED, etc.)

Module II: Indian green building rating movement

Green movement in India, Introduction to TERI, and rating systems in India e.g. GRIHA, Indian Green Building Council, EDGE green building certification, Eco Niwas etc.

Detailing of few of the rating systems along with examples needs to be done by the students.

COURSE ASSESSMENT DETAILS:

Continuous assessment can be done through regular assignments and progress of detailed working on one rating system.

All the submissions need to be assessed by the External examiner for End semester sessional term work.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- GRIHA; Griha Manual, Vol1 to 5, TERI Publication
- IGBC Manuals, CII Publication, LEED etc. manuals related to certifications
- ECBC Manual, BEE reference materials.

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To be implemented from 2020-21

Subject Name: Environmental Laws and Legislation							**Semester-III**	
Subject Code: MARE20-214								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credit
2	2	25	25	100	Nil	0	150	3

COURSE OBJECTIVE (CO):

The aim is to introduce the students to the existing environmental policies and environment laws and legislation in India.

COURSE OUTCOME: To understand different laws and legislations in the field of environment and accordingly protect the environment.

COURSE CONTENTS:

Module I: Introduction to Law and Legislations and Protocols with respect to Environment

The Constitution of India: Salient features, Fundamental Rights and Directive Principles of State Policy, Writ petitions, Public Interest Litigation. Public Health and Safety: Remedies under law of torts, law of crimes and other common law remedies. International treaties such as Kyoto Protocol, Montreal Protocol, their ratification & local laws for implementation Environmental Policies and Programmes – International and National (Policies)

Module II: Environmental Laws and Legislation

EP Act 1986,Air (Prevention and Control of pollution) Act ,Water (Prevention and Control of pollution) Act, Mines and Mineral Act,, Factories Act, Pesticides Act, Indian Forest Act, Wildlife Act, Ancient Monuments and Archaeological Sites and Remains Act, Hazardous Waste Management and Handling Rules / Biomedical Rules / Solid Waste Management / Rules, Environment Tribunal Act, Climate change Protocols and Conventions, MOEF Guidelines and Notifications, Appellate Authority Act, Other related Notifications

Module III: Environmental Notifications

Costal Regulation Zones, Dahanu taluka Eco-Fragile Area, Environment Impact Assessment of Development Projects, Matheran Eco-Sensitive Zones, Bio-Medical Waste(M&H) Rules, 1998, Hazardous Waste (M&H) Rules, 1989, Municipal Solid Waste (M&H)Rules, 2000.

COURSE ASSESSMENT DETAILS:

Assignment will be in the form of notes/assignments covering all the topics or Class test can be conducted for CA1 and CA2. End Semester Theory examination and sessional assessment.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Leela Krishnan; Environmental Law in India
- Mehta M ; Commentary on water and air pollution with environmental protection law
- Sarkar S; Legal aspects of regulations in South Asia
- Chalifour N; Land use law for sustainable development
- Birnie PW and Boyle; International law and the Environment
- SaksenaK.D ; Environmental policies and programs in India
- India Development Report IGIDR 97

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To be implemented from 2020-21

Subject Name: EIA and Environmental Management							**Semester-III**	
Subject Code: MARE20-215								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credit
1	2	10	10	80	Nil	Nil	100	2

COURSE OBJECTIVE (CO):

To understand the importance of Environmental assessment of any project.

COURSE OUTCOME:

To understand the benefits of EIA and the legal provisions for EIA studies in India.

To have the necessary knowledge of tools and methodologies of EIA studies and should be equipped to lead EIA teams.

Students are also exposed to Environmental Management systems, practices and methodology.

COURSE CONTENTS

Module I: Introduction to Environmental Assessments

This should include root, concept, definitions and perspectives, benefits and necessity of conducting EIAs, Legislative requirements of EIA studies in India

Module II: Process of EIA

- Methods of EIA; Advantages and limitations, Criteria to implement,
- Process of EIA Screening and Scoping, Team formation, expert identification etc.

Module III: Prediction and Assessment of Impacts

- Assessment of impacts on resources (Including air, water, flora and fauna), Assessment of impacts on Land use, Assessment of social and health impacts, Public Participation in EIA, PRA techniques.
- Evaluation of Alternatives & Decision making for the Preferred Alternative,
- Environmental Management Plan, Mitigation measures and their Impacts
- Structuring and Writing an EIA report

- People's participation and involvement in EIA process

Module IV: Environmental Management:

- Environmental resource management
- Development of environmental management systems with focus on ISO14000
- Implementation of environmental management systems

COURSE ASSESSMENT DETAILS:

Assignment will be in the form of notes/assignments covering all the topics or Class test can be conducted for CA1 and CA2. End Semester Theory examination and sessional assessment.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Ramachandra; Environmental management
- Talwar; Environmental management,
- Petts Judith; Handbook on Environmental Impact Assessment
- Y.Abbi & S.Jain; Handbook on energy audit and environmental management
- Larry Canter, Environmental Impact Assessment
- MoEF, Guidelines for EIA of Construction Projects
- Methods of Environmental Imapct Assessments-Edited by Peter Morris and Ricky Therival
- Eleven years of the Environment Impact Assessment Notification, 1994: how effective has it been? by Kanchi Kohli and Manju Menon kalpavriksha Environmental Action Group.
- Handbook of Environmental Analysis-Chemical Pollutants in Air, Water, Soil and Soil waste-By Pradyot Patnaik.
- Introduction to Environmental Analysis-by Roger Reeve

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Subject Name: Professional Training							**Semester-III**	
Subject Code: MARE20-216								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE Paper	ESE SV	ESE	Total	Credit
0	4	Nil	Nil	Nil	100	Nil	100	2

COURSE OBJECTIVE (CO): To give exposure to the students to the field of environmental practices and get the practical understanding about the Issues.

COURSE OUTCOME: Student should understand the ethics of environmental field to do practice in the same. Student should come up with varied project experience to understand the concepts of Environmental field.

COURSE CONTENTS:

The students will need to undertake professional training of 6 weeks full time with the concerned office at any time during the semester break (full-time) or during the semester as decided by the institution offering the course.

It involves working in associated fields of environment Architecture in India or abroad, concerned office/ organization/ NGO offering environmental protection or preventive projects.

COURSE ASSESSMENT DETAILS:

Training report along with a logbook needs to be signed weekly by the authorities. Sessional viva needs to be conducted along with the experience letter.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

As per the employer suggestions students are expected to conduct the readings.

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Subject Name: Elective-III: Sustainable Housing Policies							**Semester-III**	
Subject Code: MARE20-217A								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

To develop a holistic understanding of the parameters that determine the subjects of a housing policy, program & examine the current process that drives policymaking.

COURSE OUTCOME:

Students will understand the basics of housing policy, strategy, its formulation process, legal and economic dimensions and their implications in sustainable housing planning.

COURSE CONTENTS:

"Housing is one of those basic social conditions that determine the quality of life and welfare of people and places. Where homes are located, how well designed and built, and how well they are weaved into the environmental, social, cultural and economic fabric of communities are factors that, in a very real way, influence the daily lives of people, their health, security and wellbeing."

- United Nations Human Settlements Programme 2012

Taking this holistic approach to housing into consideration the elective shall consist of the following modules:

Module I- Establishing the Definition & Function of Housing

- Defining 'housing'; current state of housing in Indian cities
- Brief history of economic & demographic context of housing in India
- Understanding various aspects of 'housing shortage' in Indian cities.
- Understanding housing & congestion problems

Module II- Understanding the Various Components of Housing

- Housing sector & its components [land, infrastructure, finance, labor, and building materials]
- Role of the housing sector [mechanisms & institutional framework for efficient housing delivery]
- Factors affecting housing markets [understanding demand & supply inter-relations]
- Understanding social & cultural aspects of housing
- Understanding economic aspects of housing [housing affordability]

Module Iii- Existing Policies & Programs for Housing

- Understanding and evaluation of Housing Policy and programs in India
- Review of existing policies in India such as National Housing policy; Rajiv Awas Yojana; National Housing & Habitat Policy; National Urban Housing & Habitat Policy; Pradhan Mantri Awas, Yojana etc
- To explore the policy aspects and finance mechanism in housing.
- Deriving a sustainable approach to housing policies and Strategies.

COURSE ASSESSMENT DETAILS:

- Critical writing w.r.t various housing sector components
- Comparative analysis of existing policies
- Case Study on Social Housing and Slum Improvement schemes, housing schemes by Government / private sector organizations.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

1- Affordable Housing and Infrastructure in India- By K. P. Bhattacharya
2- Urban Development and Housing in India, 1947 to 2007- By Rishi Muni Dwivedi
3- The Legal Right to Housing in India- By Anindita Mukherjee
4- Housing Sector In India - Issues, Opportunites And Challenges- By Balaji V Rajmanohar T P
5- Housing Finance in India: Turning Dreams Into Reality- By Ruchi Jain

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Subject Name: Elective-III: Contemporary Practices in Sustainable Architecture							**Semester-III**	
Subject Code: MARE20-217B								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE STW	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

To document & analyze contemporary sustainable architectural precedents so as to examine the application of various facets of sustainable architecture.

COURSE OUTCOMES:

Students shall develop ability to critically appreciate various existing built typologies in the context of sustainable architecture.

COURSE CONTENTS:

What all does the word 'sustainable architecture' encompass ?

What all are the ways of 'Going Green' ?

This elective shall focus upon the learnings derived from studying a diverse range of cases which have incorporated efficient/ sustainable/ green measures at different hierarchies in their planning, execution & operation.

MODULE-I: FORM STUDY: DERIVED FROM CLIMATE-RESPONSE

- Studying examples of buildings having explored diverse forms through the help of parametric designing / other simulation tools / other innovative & exploratory designing processes
- Studying & analyzing buildings having incorporated biometric architecture

MODULE-II: SITE LEVEL RESPONSES: ENERGY CONSERVATION THROUGH VARIOUS MEANS

- Studying examples of medium to large scale buildings wherein activity zoning plays a pivotal role in conserving site energy
- Examples wherein different building elements are used for storing & harnessing site energy

MODULE-III: GREEN MATERIALS & CONSTRUCTION TECHNIQUES

- Studying examples of built spaces incorporating low embodied energy materials as well as construction techniques
- Examples involving low cost materials & construction techniques

MODULE- IV: EXPLORATIONS IN ENVELOPE DESIGN

- Studying examples of building with fenestration design as the focus w.r.t different climate types

COURSE ASSESSMENT DETAILS:

- Literature / live case studies (Minimum 1 from each module) on the above modules
- Critical writing w.r.t the application of facets of sustainable architecture

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Biomimicry in Architecture- By Michael Pawlyn
- Strategies for Sustainable Architecture- By Paola Sassi
- Green Architecture- James Wines
- Sustainable Design: A Critical Guide- By David. A. Bergman
- Modern Construction Envelopes- By Andrew Watts
- Laurie Baker- By Gautam Bhatia

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Subject Name: Elective-III: Post Occupancy Evaluation							**Semester-III**	
Subject Code: MARE20-217C								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE Paper	ESE SV	ESE STW	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

To develop understanding of 'Post Occupancy Evaluation' as a critical tool of building performance assessment & create the base for conducting POE of small-scale built spaces.

LEARNING OUTCOMES:

Students are expected to conduct POE of different building types & present their review on the same.

COURSE CONTENTS:

This elective shall introduce the concept of POE by going into the roots of it. It shall focus upon the process of conducting a POE as well as the different approaches to conduct it.

Module I: Evolution Of P.O.E

- Importance of performance assessment; Importance of POE from green building point and health and wellbeing of people point of view. Definition of POE; Benefits of conducting POE; hurdles to conducting POE
- Purposes on conducting POEs
- Types of POEs [Indicative, Investigative, diagnostic]

Module Ii: P.O.E- Process

- Phases/ steps involved in the process of conducting POE
- Types of Post Occupancy evaluations; Management of data / information required for POE
- POE in the Indian context

COURSE ASSESSMENT DETAILS:

- Case studies and reviews related to modules can be conducted for CAI and CAII along with Conducting POE of a small built space. End semester external sessional assessment.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Robert B. Bechtel and Arza Churchman "Handbook of Environmental Psychology", John Wiley & Sons Inc., New York 2002.
- Wolfgang Preiser & Edlaine Ostroff "Universal Design Handbook",McGraw Hill, 2001.
- James Douglas "Building Adaptation", Elsevier, Oxford 2002.
- Evans, R., Haryott, R., Haste, N. and Jones, A. (1998), The Long Term Costs of Owning and Using Buildings, Royal Academy of Engineering, London. Finch, E. (1999),
- "Empathetic design and post-occupancy evaluation", Facilities, Vol. 17 No.11,pp.431-5. Friedman, A., Zimring, C. and Zube, C. (1978),
- Environmental Design Evaluation, Plenum,New York, NY.
- RIBA (1965), Handbook of Architectural Practice and Management, RIBA Publications, London.
- RIBA, R.S.G. (1991), "A research report for the architectural profession", in Duffy, F.W. (Ed.),
- Architectural Knowledge: The Idea of a Profession, E. & F.N. Spon, London
- RIBA (1965), Handbook of Architectural Practice and Management, RIBA Publications, London.
- RIBA, R.S.G. (1991), "A research report for the architectural profession", in Duffy, F.W. (Ed.),Architectural Knowledge: The Idea of a Profession, E. & F.N. Spon, London

MAHATMA GANDHI MISSION
MGM UNIVERSITY, AURANGABAD
Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

MGM UNIVERSITY
Jawaharlal Nehru Engineering College
Curriculum framework

Second Year- Master of Architecture (Environmental)

Semester IV

MAHATMA GANDHI MISSION
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Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

Subject Name: Dissertation II							**Semester-IV**	
Subject Code: MARE20-221								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	ESE Paper	ESE SV	ESE STW	Total	Credit
2	12	250	250	Nil	Nil	500	1000	20

COURSE OBJECTIVE (CO):

This course expects application of research findings to solve identified problem in the built environment at planning or design level.

COURSE OUTCOME:

The proposal can be policy level and / or architectural but must be application relevant to Environmental architecture.

COURSE CONTENTS

- Dissertation must address the issues or new ideas in the field of environmental architecture.
- Drawing informed and scientific conclusions from the research carried out in Dissertation I and applying the findings in at policy or design level addressing some problem of significance.
- The topic of dissertation can address the issues of built environment, urban, rural development, building level environmental solutions, the issues related to climate change, environmental laws and legislations, environmental impact, Carbon emissions, etc.
- Format of report (black book) should be as per prescribed by the university, the proposal should be in the form of drawings or statistical data relevant to environmental field.

COURSE ASSESSMENT DETAILS:

- Continuous assessment needs to be done on regular interval along with Department project assessment committee along with subject experts.
- Guide should mark 70 % of Continuous assessment, committee members should mark 30% of marking.
- End semester external viva assessment should be done by external subject expert.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- McMillan, K & Weyers, J (2007) How to write dissertations and project reports. Pearson Prentice Hall.
- Watson, G (1987) Writing a thesis: a guide to long essays and dissertations, London: Longman. Specialist bibliography according to the project.
- Turabian, K (2007) A manual for writers of research papers, theses, and dissertations, 7th Edition, Chicago: University of Chicago Press.
- As appropriate for each individual thesis.

MAHATMA GANDHI MISSION
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Master of Architecture (ENVIRONMENTAL ARCHITECTURE)
To be implemented from 2020-21

Subject Name: Elective-IV: Smart & Eco Cities							**Semester-IV**	
Subject Code: MARE20-222A								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE Paper	ESE SV	ESE STW	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

To develop understanding regarding the interpretation of the term ‘ Smart ’ and ‘Eco’ in the context of city planning & governance.

COURSE OUTCOME:

Students shall develop understanding of new city planning & governance concepts in order to plan for the unexpected growth of cities which creates unprecedented sustainability challenges viz. increasing demands for energy, water, sanitation, education, healthcare, housing & transportation.

COURSE CONTENTS

MODULE I- GLOBAL SMART CITY CONNOTATIONS

- The need to define a smart city; discourses on the interpretations of smart cities; Emergence of the smart city concept
- Brief study of smartest cities around the world (Lessons derived from those)
- Smart city features, core infrastructure elements & their inter-relationships
- Government parameters for SMART cities; process of selection of Smart cities

MODULE II- SMART URBAN STRATEGIES

- Understanding redevelopment, retrofitting, area-based development & Pan city initiatives as smart development strategies
- Smart City Index: Considerations
- Case studies of smart city proposals in India (Nagpur, Raipur etc)

MODULE III- ECO CITIES

- Origins of the concept of 'Eco city'; environment & urbanization
- Characteristics of eco cities.
- Learning principles of green urbanism
- Global case studies of eco cities.

COURSE ASSESSMENT DETAILS:

- Case studies of smart & eco cities in India & abroad related studies or reviews to modules of the elective. End semester external sessional assessment.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Biopolis: Patrick Geddes and the City of Life Welter, Volker, MIT Press, 2001.
- Car free Cities Crawford, J. H., International Books, 2002,
- Cities for a Small Planet Rogers, Richard, Westview Press, 1998,
- The City After the Automobile: An Architect's Vision Safdie, Moshe, Westview
- Press, 1998,
- The City in Mind: Notes on the Urban Condition Kunstler, James Howard,
- Touchstone Books, 2003
- Crabgrass Frontier: The Suburbanization of the United States Jackson, Kenneth T.,
- Oxford University Press, 1987,
- Eco-City Dimensions: Healthy Communities, Healthy Plants Roseland, Mark, New
- Society Publishers, 1996,
- From Eco-Cities to Living Machines: Principles of Ecological Design Todd, John,
- North Atlantic Books, 1994,
- The Ecological City: Preserving and Restoring Urban Biodiversity Platt, Rutherford
- H., University of Massachusetts Press, 1994,
- Gaviotas: A Village to Reinvent the World Weisman, Alan, Chelsea Green
- Publishing Company, 1999,
- The Geography of Nowhere: The Rise and Decline of America's Man-Made
- Landscape Kunstler, James, Touchstone Books, 1994.
- Home from Nowhere: Remaking Our Everyday World for the 21st Century Kunstler,
- James Howard, Touchstone Books, 1998.
- Human Settlements and Planning for Ecological Sustainability: The Case of Mexico
- City Pezzoli, Keith, MIT Press, 2000.

MAHATMA GANDHI MISSION
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To be implemented from 2020-21

Subject Name: Elective-IV: Sustainable Urban Conservation							**Semester-IV**	
Subject Code: MARE20-222B								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

To develop a broader understanding of the historic urban built environment so as to learn its tangible & intangible aspects & learn the various approaches to conserve the same.

COURSE OUTCOMES:

- Students shall be equipped with the understanding of how to deal with development in & around the historic urban areas of a city.
- Students shall gain insight regarding the social & cultural connotations of such historic places as well as the issues in conserving them.

COURSE CONTENTS:

In this context, this elective shall firstly **establish the objectives & philosophy of conservation** & facilitate the discussion on **what all needs to be conserved.** It shall not only focus on the principles & ethics of conservation but also throw light on the **approaches to conservation** in the context of historic urban areas. Lastly, it shall facilitate discussions on the practices of national organizations involved in the field of urban conservation through literature case studies.

MODULE-I: INTRODUCTION TO CONSERVATION

- Conservation as a concept; Its background; history of the conservation movement
- Philosophy of conservation; Principles of conservation, Ethics of conservation

MODULE-II: UNDERSTANDING HISTORIC URBAN LANDSCAPES

- Understanding what all encompasses ‘urban heritage’; Understanding the role of urban landscapes in the socio-cultural realm; Idea of ‘cultural landscape’; Relation between natural & cultural heritage

- Key challenges & threats to the historic urban landscapes due to development; Relationship between historic urban landscapes & the natural environment
- Relationship between the tangible & intangible heritage

MODULE- III: APPROACHES AND TOOLS FOR CONSERVATION OF HISTORIC URBAN LANDSCAPES

- Culture as a tool for promoting sustainable urban development
- Roles & responsibilities of factors in conservation outcomes; relationship between the actors
- Governance & policy framework for urban conservation
- Introduction to urban analysis & mapping tools

COURSE ASSESSMENT DETAILS:

Identifying historic urban precincts & mapping their condition, Literature case studies on conservation projects, Case studies related to the modules. End semester external sessional assessment.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Appleyard, D. (Ed.). (1979). The Conservation of European Cities. Massachusetts: M.I.T. Press.
- Basu, S., Mukerji A (Eds.) (2017). Integrated Urban Conservation: An Approach towards Development, ISBN: 978-93-5268-866-1, Kharagpur: Department of Architecture and Regional Planning, IIT, Kharagpur.
- Croci, G. (1998). The Conservation and Structural Restoration of Architectural Heritage. Southampton, UK: WIT Press.
- Fitch, J.M. (Reprint edition 1990). Historic Preservation: Curatorial Management of the Built World. Virginia: University Press of Virginia.
- Cullinane, J. J. (2012). Maintaining and Repairing Old and Historic Buildings. Wiley-Blackwell.
- Evans, N.L. (2014). An Introduction to Architectural Conservation: Philosophy, Legislation and Practice. London: RIBA Publishing.
- Feilden, B. M. (2003). Conservation of Historic Buildings. London: Routledge.
- Glendenning, M. (2013). The Conservation Movement: A History of Architectural Preservation: Antiquity to Modernity. London: Routledge.
- Stipe, R.E. (2003). A Richer Heritage: Historic Preservation in the Twenty-first Century. North Carolina: The University of North Carolina Press.

MAHATMA GANDHI MISSION
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To be implemented from 2020-21

Subject Name: Elective-IV: Adaptive reuse and retrofit							**Semester-IV**	
Subject Code: MARE20-222B								
Teaching		**Evaluation Scheme**						
Theory	Studio	CA1	CA2	ESE	ESE SV	ESE	Total	Credits
1	2	25	25	NIL	NIL	50	100	2

COURSE OBJECTIVE (CO):

To make student understand the purpose adaptive reuse of buildings is a desirable alternative to new construction in terms of sustainability and a circular economy.

COURSE OUTCOMES:

Students should understand the importance of this from sustainable point of view so as to come out with the option of adaptive reuse or retrofit.

Preservation of resources is one of the main focus of sustainability, adaptive reuse is a good alternative to achieve so.

COURSE CONTENTS:

This elective shall firstly make student understand basics of Adaptive reuse. facilitate the discussion what exactly needs to be adopted for reuse and how. The adaptive reuse of heritage buildings can be from conservation of building principals and rules needs to be followed.

MODULE-I: INTRODUCTION ADAPTIVE REUSE & RETROFIT OF BUILDINGS

- Retrofitting of existing buildings in different ways. This approach can be adopted for existing buildings,
- Element of buildings - structural retrofit, facade, services, interior retrofit, Performance analysis of existing buildings, Physical audits, Building Simulation, Metering and tracking options, Analysis the building's current performance,
- Decision influencers for retrofit and reuse, economic, social and environmental issues

MODULE-II: REUSE OF OLD BUILDINGS OR HERITAGE BUILDINGS.

- Understanding the importance of adaptive reuse of buildings. Analysis of such building like retrofitting such as physical audit etc.

- Decision influencers for reuse, economic, social and environmental issues
- Assessment methods for such buildings through case studies.

MODULE III: SUSTAINABLE CONSERVATION OF HERITAGE STRUCTURES

- Heritage building principals and guidelines for adaptive reuse needs to be understood and considered, Conservation of heritage structures
- Sustainability in heritage structures, Adaptive reuse of heritage structures, Issues in adapting a heritage structure, Use of sustainable conservation techniques, Case studies of sustainable conservation in heritage structures as adoptive reuse.

COURSE ASSESSMENT DETAILS:

- Case studies related to the modules. Critically analysis of different articles and reviews of the same can be done for continuous assessment. Proposal for nearby existing or old building is expected as outcome.
- End semester external sessional assessment.

COURSE REFERENCE MATERIAL (RECOMMENDED READINGS)

- Sara J. Wilkinson, Hilde Remoy, Craig Langston, Sustainable Building Adaptation: Innovations in Decision-making, John Wiley and sons, 2014
- John Krigger, Residential Energy: Cost Savings and Comfort for Existing Buildings, Prentice Hall, 2009
- Paul Apple, Sustainable Retrofit and Facilities Management, Routledge, 2013
- Zeynep Aygen, International Heritage and Historic Building Conservation: Saving the World's Past, Routledge, 2013
- Achieve Hospitality Architecture That Impresses – Part 3: Give New Life to an Old Building with Adaptive Reuse By April Maifield
- Design Principles of Adaptive Reuse: Case Studies on Dockyard
- "A new future for the past: a model for adaptive reuse decision-making". Built Environment Project and Asset Management. Bullen, Peter; Peter,8 July 2011, By ISSN 2044-124X