

**Dr.BabasahebAmbedkar Technological University, Lonere,
Raigad**

**Proposed Syllabus for Masters in Architecture
(Environmental)**

Date: 26rd March 2018

PREAMBLE

The Academic Council of Dr.Babasaheb Ambedkar Technological University aims at bridging the gap between the Industry and the Institute by framing a syllabus on the Guidelines of Council of Architecture, India and fine tuning the same with respect to the requirements of the building industry at the international and national level.

The students have been made sound enough through the Graduation Program, to proceed to Masters in any part of the World and be suitable enough to support any good Architectural office across the globe or raise his / her professional practice.

The Education at Masters Level is oriented to develop students with modern Skills and Techniques, in specialist field of Architecture i.e. Construction Management, Environmental Architecture and General (aspects in Architecture).

The Education is desired to orient and to equip students with modern skills and techniques of designing structures and detail them further with precise constructional details, use of most suitable materials, examine the sustainability attributes and further specify the process of implementation with the value addition of conservation of energy flavoured with modern architectural concepts giving justice to the various spaces in their chosen field of specialisation (within and around the built form), they are meant to perform.

The architectural institutes shall also educate the students on their responsibility as a professional, to create designs that shall adhere to all the local regulations and laws of the land and should provide updated knowledge of procedures to be followed from work commencement to completion.

The graduate course (B.Arch) shall be of Ten semesters (stage I & stage II) and the detailed subject wise pattern shall be strictly adhered to.

The Masters Course (M. Arch) shall be of 4 semesters and detailed subject wise pattern enclosed along with this preamble shall be strictly adhered. The Universities stipulates that maximum students in each class be 20 only and sections may be added for additional intakes

M.Arch (Environmental Architecture):

Environ is a base of Sustainable Architecture and therefore the Masters Course is specialisation on Environmental Architecture. Environmental Architecture shall focus on Design and detailing of various Environmental elements, contribute into creating a better and sustainable environment. The course aims at providing a detailed knowledge of environmental practices, implementation and design of sustainable built architecture.

The libraries shall be equipped with internet facility with a computer lab to provide students networking opportunities with other Institutes/Universities across the world. Facebook /Twitter/Blogs/any othersocial media tool shall be used to create data that may be required time and again as student/faculty flow year on year.

The Institution shall encourage exchange programs of faculty and students with other Universities in India and abroad to help develop them.

Emphasis shall be given to live site visits, interactions with the client's promoters, contractors and also approving authorities and project managers to get feedback on drawings, details, specifications, selection of materials, techniques of constructions.

The institutes are expected to conduct seminars on newer technologies and materials by inviting players from the market/industry and faculty and the students should take it further through interactive workshops. The institutes shall also encourage students to attend conference and conventions of architectural organizations within India and Abroad.

The Institute shall guide students to leading architectural offices within and outside the Country for the internship course and shall conduct interactive feedback workshops for exchange of ideas and experience of the building industry and professional office working. The subject of Professional training shall be constantly updated based on changing trends and their expectation from professional architect's. Inviting leading architects to share on the above subject within the institute may help in building confidence within out-going graduates.

The BATU syllabus is composed by team of experts after thorough examination and comparative analysis of syllabi of colleges of architecture in India and intends to further modify or amend that maybe required by the foreign universities offering BATU their accreditation in order to respond to rapidly changing industry, society and environment, national and international economic dimensions.

The Above architectural technology benchmark statement shall/may reflect these changes in the context of the building Industry, including the need to produce graduates that are employable yet adaptable, agile and flexible to respond to future challenges and changes.

List of Abbreviations

Sr.No.	Acronym	Full form
1	TH	Theory
2	SWT	Sessional Work with Assessment
3	SV	Sessional Work with Viva
4	L	Theory Lecture
5	S	Studio
6	IA	Internal Assessment
7	MSE	Mid Semester Exam
8	ESE	End Semester Exam

Teaching Scheme:

Each Lecture to be conducted should be of 60 min duration.

Each Studio to be conducted should be of 60 min duration.

1 Credit Point = 1 Hour Lecture (For Theory subject)

1 Credit Point = 2 Hour Studio

Mandatory Passing Criteria:

All the rules and regulations for Allowed To Keep Terms (ATKT) from Dr.BabashaebAmbedkar Technological University (DBATU) should apply.

Each student should publish a Research Paper in recognised National / International Journal during the Second Year of Masters. The research paper should be related to the Dissertation topic selected for Semester 4 of the Second year.

The impact factor of the journal should be 1 and above.

Final Degree Class / Division and Marks / Percentage / Credits / Grade needs to be given as average score of all 4 Semesters, with Absolute Grading.

Reporting of Submissions by the students and Institutes:

All students should mandatorily submit the course work to the college, completed in the class at the end of the day through the servers to the college / university.

The evaluation of the work done in the class by the student should be done by the teacher on the same day and data to be maintained on the server.

Use of Computers:

The institutes can allow the use of computers as found suitable.

Study Tours:

Study tours can be organised by the institutes to make the student aware of the various aspects of architecture. At least 1 study tour per year should be organised.



Teaching and learning Process Matrix:

This matrix is to be used by the teachers and students to understand subject in detail.

It will unfold the desired skill sets required along with identification of teaching and learning process approach indicators.

It will also help teachers and students to evolve concepts and module development.

This is a tool recommended to be followed by subject teachers. It will create learning and understanding process of the subject.

Sr. No.	Subject Heads 	Subject -1	Subject -2	Subject-3	Subject -4
	Definitive questions for learning subjects 				
1	How does learning occur?				
2	What factors influence learning?				
3	What is role of learning?				
4	How does transfer occur?				
5	What type of learning are best explained by theory / drawing?				
6	How is technology used for learning in Architecture?				

Dr. BabasahebAmbedkar Technological University

First Year

Masters in Architecture - Environmental Architecture

Semester -1

Subject Codes	Subject	Teaching		Evaluation Scheme					Total	Credit
		Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE SV /STW		
MAREA1 0100001	Design Studio I(Environmental)	2	6	50	50	0	0	150	250	5
MAREA1 0100002	Climate Responsive Design-I	2	4	20	20	40	60	60	200	4
MAREA1 0100003	Green Building Materials and construction technology	2	4	20	20	40	60	60	200	4
MAREA1 0100004	Sustainable Development & Planning	2	2	10	10	40	60	30	150	3
MAREA1 0100005	Building Services and Management	2	0	20	20	0	0	60	100	2
MAREA1 0100006	Elective-I (Building Simulation Software)	0	4	20	20	0	0	60	100	2
MAREA1 0100006A	Autodesk Ecotect									
MAREA1 0100006B	Design Builder									
MAREA1 0100006C	Revit Plugin, etc									
	Total	10	20	140	140	120	180	420	1000	20

Dr. BabasahebAmbedkar Technological University**First Year****Masters in Architecture - Environmental Architecture****Semester -2**

Subject Codes	Subject	Teaching		Evaluation Scheme					Total	Credit
		Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE SV /STW		
MAREA1 0200001	Design Studio II (Energy Efficient)	2	6	50	50	0	0	150	250	5
MAREA1 0200002	Environmental and Ecological Planning	2	2	10	10	40	60	30	150	3
MAREA1 0200003	Climate Responsive Design -II	2	4	20	20	40	60	60	200	4
MAREA1 0200004	Energy Resource Management & Building Energy Management	2	4	40	40	0	0	120	200	4
MAREA1 0200005	Research Methodology	2	0	10	10	20	60	0	100	2
MAREA1 0200006	Elective-II	0	4	20	20	0	0	60	100	2
MAREA1 0200006A	GIS and Terrain Mapping									
MAREA1 0200006B	Façade Design									
MAREA1 0200006C	Smart and Eco Cities									
	Total	10	20	150	150	100	180	420	1000	20

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Second Year

Masters in Architecture - Environmental Architecture

Semester -3

Subject Codes	Subject	Teaching		Evaluation Scheme					Total	Credit
		Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE SV /STW		
MAREA2 0100001	Design Studio III (Sustainable Planning Studio)	2	6	50	50	0	0	150	250	5
MAREA2 0100002	Dissertation I (Research Paper Writing)	2	4	40	40	0	0	120	200	4
MAREA2 0100003	Environmental Economics	2	0	10	10	20	60	0	100	2
MAREA2 0100004	Environmental Management systems & EIA (EIA, LCA, Carbon Footprint and Mapping, Green Building Rating systems)	2	4	40	40	0	0	120	200	4
MAREA2 0100005	Law and Legislations for Environmental Control	2	2	10	10	40	60	30	150	3
MAREA2 0100006	Elective-III	0	4	20	20	0	0	60	100	2
MAREA2 0100006A	Sustainable Housing Policies									
MAREA2 0100006B	Contemporary Practices in Sustainable Architecture (Architects Work)									
MAREA2 0100006C	Conservation as a tool for sustainability									
	Total	10	20	170	170	60	120	480	1000	20

Dr. BabasahebAmbedkar Technological University**Second Year****Masters in Architecture - Environmental Architecture****Semester -4**

Subject Codes	Subject	Teaching		Evaluation Scheme					Total	Credit
		Theory	Studio	CA1	CA2	MSE	ESE Paper	ESESV /STW		
MAREA2 0200001	Dissertation II (Environmental Architecture / Planning)	0	20	100	100	0	0	300	500	10
MAREA2 0200002	Energy Audit and ECBC	0	4	20	20	0	0	60	100	2
MAREA2 0200003	Professional Training (Six week)	0	0	0	0	0	0	100	100	2
	Total	0	24	120	120	0	0	460	700	14
Note	Six week training should be done in vacation of third semester and certificate needs to be produced									

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- Final Degree Class / Division and Marks / Percentage / Credits / Grade needs to be given as average score of all 4 Semesters, with Absolute Grading.
 - Each student should publish a Research Paper in recognized National / International Journal during the Second Year of Masters. The research paper should be related to the Dissertation topic selected for Semester 4 of the Second year.
 - The impact factor of the journal should be 1 and above.

**Dr.BabasahebAmbedkar Technological University, Lonere,
Raigad**

MASTERS IN ARCHITECTURE – Environmental

FIRST YEAR

SYLLABUS 2018

Design Studio I (Environmental)							Semester-I	
SubjectCode– MAREA10100001								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	EESV	Total	Credit
2	6	50	50	0	0	150	250	5

1: Learning Objectives

To understand and analyze, climate and its elements at both micro and macro level planning and design projects of varied scales with passive design strategies.

2: Learning Outcomes

Design outcome of at least two design projects (Building scale & Site scale) using passive design strategies will be assessed as per design brief.

3: Teaching Modules

Small Scale: Design of a small unit to respond to building level element and strategies like facade design etc.

Large Scale: Application of ambient level strategies mainly the Sun and Wind in a design of macro level/micro level. Detailed Site level design strategies for environmental design.

4: Exercises:

Small Project: Bungalow level projects etc.

Large Scale: Campus, Housing Projects etc.

5: Mode of Examination as per teaching and evaluation scheme:

Sessional work with Viva

6: List of Reference Books.

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

Climate Responsive Design-I							Semester-I	
SubjectCode– MAREA10100002								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE STW	Total	Credit
2	4	20	20	40	60	60	200	4

1: Learning Objectives

To understand and analyze climatic elements and factors to design climate responsive buildings with greater emphasis on functional aspects involved in various climate.

2: Learning Outcomes

To focus on human comfort at large, while implementing effective passive design strategies for built spaces.

3: Teaching Modules

Unit I - Climate Analysis and classification

Understanding Earth-Sun relationship, Elements of Climate, Global Climate, Analysis of macro & micro climate, Climatic zones in India.

Interpretation of climatic data through Climate Data, Solar Path Charts, Psychometric Charts, Bioclimatic charts.

Unit II - Principles of Thermal Design

Thermal quantities, Heat exchange in buildings, balance point temperature and periodic heat flow.

Unit III –Climate and building elements

Orientation, built spaces, building envelope, fenestrations, shading devices, roofs, walls etc.

Unit IV - Passive design strategies (Vernacular Strategies)

Implementation of Passive Design Strategies in architectural elements to achieve thermal comfort- Natural ventilation, Cross ventilation, Stack ventilation, wind tower etc.

4: Exercises:

Assignments related to above topics can be done through Live/Book/Net Case studies.

Journal with exercises to elaborate the above mentioned theories and concepts.

5: Mode of Examination as per teaching and evaluation scheme:

Sessional work and end semester theory examination.

6: List of Reference Books.

- O.H.Koenigsberger; Manual of Tropical Housing & Building, University Press
- G.K.Brown and Mark DeKay ; Sun,Wind and Light, John Wiley and Sons, INC
- Arvind Krishnan: Climate Responsive Architecture
- Bansal. N; Passive building design, London
- Givoni; Man, Climate and Architecture

Green Building Materials and Construction Technologies							Semester-I	
Subject Code– MAREA10100003								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESESTW	Total	Credit
2	4	20	20	40	60	60	200	4

1: Learning Objectives

To understand Green Building Materials and alternative building construction technologies.

2: Learning Outcomes

Application of green material for the buildings and experimentation with new technologies involved.

3: Teaching Modules

Unit I - Green Building Materials

Study of Green building materials like steel, fly ash bricks, gypsum, eco-boards, bamboo, mud, straw bale etc. their physical properties, composition, production and recycling, etc.

Unit II - Embodied energy

Embodied energy of green building materials, environmental impact of green building materials, Life Cycle of green building materials.

Unit II - Green Building Technologies

Introduction to alternative green building technologies:

Traditional and advanced techniques involved in construction of buildings. Eg. Complete solution for green structures, Curtain Walls, Pre-fabrication and Modular, external and internal finish etc.

4: Exercises:

A written journal explaining all the above mentioned principles.

Case studies and presentations to understand the practical application of the various materials and technologies.

5: Mode of Examination as per teaching and evaluation scheme:

Sessional work and end semester theory examination.

6: List of Reference Books.

- *Green Architecture, Design for a sustainable future*
- *Energy efficient buildings by Wagner Walter*
- *Architecture, Engineering and Environment by Hawkes Dean and Foster Wayne*
- *The architecture of Energy by Hawkes Dean and Owets Janet*
- *Manual of Tropical housing and climate by Koenisberger*
- *Design for Environment by Mackenzie*
- *Energy Efficient Buildings in India by MilliMujumdar*
- *Earth Construction by Houben Hugo*
- *Green Building Materials by Ross Spiegel and Dru Meadows*
- *Publications from - CBRI –Roorkee- IDC – Mumbai- NID - Ahmedabad*

Sustainable Development & Planning							Semester-I	
SubjectCode– MAREA10100004								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESESW /STW	Total	Credit
2	2	10	10	40	60	30	150	3

1: Learning Objectives

1. To develop an understanding to mitigate climate change issues at neighborhood level and to expose to the steps involved in sustainable urban design projects.
2. To expose the students with the cross sectorial relationship between various components of urban planning and sustainable planning.

2: Learning Outcomes

Students should understand concept of sustainable planning and expose to the emerging concepts in sustainable planning like, smart city concept, eco-city concept, etc.

3: Teaching Modules

Unit I - Planning and Development theory

1. Concepts and Theory: Brownfields and Neighborhood Development
2. Principles of urban planning, classifications of human settlements (Indian context) and study national planning standards like UDPFI guidelines.
3. Housing theory and policies in India.

Unit II – Theory of social planning

1. Introduction to the theory of social planning and study various examples of socially inclusive planning projects, community participation in planning process, etc.
2. Study examples / case studies of social infrastructure planning (Chandigarh, Ghandinagar, Naya Raipur, Navi Mumbai, etc.)

Unit III – Sustainable Planning and Development

1. Theory and principles of sustainable planning
2. Issues of sustainable urban design and neighborhood planning.
3. Introduction to tools of sustainability and The Future(s) of Sustainability
4. Case study analysis of smart cities, eco-cities (national and international)

4: Exercises:

Group submission based on above exercise,

Seminar/presentation of various aspects, issues of sustainable development (individual assignment).

5: Mode of Examination as per teaching and evaluation scheme:

Mid Semester and End Semester Theory Paper

6: List of Reference Books.

- Stephen Wheeler; *Planning for Sustainability*,
- Simon Presner; *Principles for Sustainability*
- Cecilia Tacoli; *Urban Linkages*
- Monto & Ganesh; *Sustainability by human settlements*
- Sampson; *The WTO and sustainable development*
- *Achieving sustainable cities in SE Asia region*
- Antonio Layards; *Planning for Sustainable future*
- D Farr; *Sustainable Urbanism*
- Tifiin J; *Transport communications*
- Brain; *Transport in Cities*
- K. Lynch; *The Image of the City*, MIT Press
- Edington John; *Ecology and Environmental Planning*
- Alexander Christopher; *A pattern Language The Environment, Public Health and Human Ecology consideration for Economic Development.*

Building Services and Management (Water and Waste)							Semester-I	
SubjectCode– MAREA10100005								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESESTW	Total	Credit
2	0	20	20	0	0	60	100	2

1: Learning Objectives

The primary goal is to provide a comprehensive understanding of waste management from an environmental public health perspective and to get thorough knowledge of Water and waste management system for green development.

2: Learning Outcomes

Different concepts involved in Green Building services and technologies.

3: Teaching Modules

Unit I – Water Management

1. Introduction, water demand, growing water misuse, pollution, threat to environment, social implications, and sustainability of water resources, ground water management, and issues related to urban water supply.
2. Running water and underground water; channel networks and drainage basins, hill slope geomorphology.
3. Water supply systems (sources, pumping, reservoirs, water treatment, tanks, pipe materials).
4. Quality and quantity standards for water; Sewerage and Sewerage Treatment Plants.
5. R.O. system for potable water; Storm water system; Rain water harvesting.
6. Plumbing system, fittings and fixtures; Hydropneumatic systems; Multi-stage pumping; Measures for effective water management in Buildings; netzero water approach.

Unit II – Waste Management

1. Identify and discuss the public health, regulatory, planning, technical and economic principles that influence the solid waste management system.
2. Describe appropriate methods to minimize the impact on the public's health from solid waste related activities.
3. Analysis of an integrated solid waste handling system including source reduction, recycling and reuse, composting, land filling and combustion.
4. Develop a more informed opinion on a variety of waste related issues such as electronic waste, industrial waste, medical waste and C&D (construction and demolition) waste etc.
5. Sustainable techniques in municipal solid waste management and others: Introduction, Segregation, Sorting, Composting, Vermi composting, Home composting, Recycling and Reuse.
6. Incineration method, Scientific Land filling, Energy development and Management of urban waste services.

4: Exercises:

- Group submission based on above topics
- Seminar/presentation of various aspects, issues of sustainable services (individual assignment).

5: Mode of Examination as per teaching and evaluation scheme:

Sessional term work

6: List of Reference Books.

- *Constitutional Law of India – J.N. Pandey 1997 (31st Edition.) Central Law Agency,*
- *Administrative Law U.P.D. Kesari 1998. Universal Book Trade, Delhi.*
- *Environmental Law H.N. Tiwari, Allahabad Law Agency, 1997.*
- *Environmental, A., Divan and Noble M. Environmental Law and Policy in India (cases, Materials and Statutes) 1991 Tripathi, Bombay.*
- *Environmental Policy. Forest Policy. Bare Acts – Government Gazette notification.*
- *Environmental Laws of India-C.P.R. Environmental Education Centre*
- *DEWATS, Auroville.*
- *Water Sensitive Urban Design: Principles and Inspirations for Sustainable Stormwater Management in the City of the Future, Author: Jacqueline Hoyer, Wolfgang Dickhaut, Lukas Kronawitter, Björn Weber, ISBN 978-3-86859-106-4*
- *Design for Water | Rainwater Harvesting, Storm water Catchment, and Alternate Water Reuse, Author: Heather Kinkade-Levario, Date of publication: June 2007, Publisher: New Society Publishers; 1 edition, ISBN 978-0865715806*
- *Living Systems | Innovative Materials and Technologies for Landscape Architecture, Authors: Liat Margolis, Alexander Robinson, Publisher: BirkhäuserArchitecture, Date of publication: June 2007, ISBN 978-3764377007*
- *Sustainable Infrastructure | The Guide to Green Engineering and Design, Author: S. BrySarte, Date of publication: September 2010, Publisher: Wiley, ISBN: 978-0470453612*
- *Water Centric Sustainable Communities | Planning, Retrofitting and Building the Next Urban Environment, Author: Vladimir Novotny, Jack Ahern, Paul Brown Publisher: Wiley, Date of publication: October, 2010. ISBN 978-0470476086*
- *Waterscapes | Planning, Building and Designing with Water, Author Editors: Herbert Dreiseitl, Dieter Grau, Karl H.C. Ludwig, Publisher: Birkhäuser Basel, Date of publication: April, 2001, ISBN 978-3764364106*

Elective-I (Building Simulation Software)							Semester-I	
SubjectCode– MAREA10100006								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESESTW	Total	Credit
0	4	20	20	0	0	60	100	2
MAREA10100006 A		Autodesk Ecotect						
MAREA10100006B		Design Builder						
MAREA10100006 C		Revit Plugin						

1: Learning Objectives

To get the practical knowledge of software related to environmental architecture field. The software skills shall be used for various applications like lighting, thermal comfort of spaces, energy calculations along with other parameters like climate, materials selection and shadow analysis.

2: Learning Outcomes

Different exercises related to environmental analysis of buildings.

3: Teaching Modules

Overview of Energy Simulation Software and Introduction:

Unit –I Introduction: Hands-on experience of modelling in the software along with introductory parameters and their studies like:

Unit –2 Analysis: Climatic analysis, shadow analysis, material selection etc.

Unit –3 Lighting: Calculations and inferences for day lighting and application of artificial lighting along with its analysis.

Unit –4 Thermal Comfort: Calculations for thermal comfort of spaces and its associated parameters like heat gains-losses, temperature profiles, fabric gains-losses, ventilation etc.

Unit –5 Internet & cyber security: Overall internet and cyber security will be introduced to the students as part of the curriculum.

4: Exercises:

To generate the reports and assignments with individually done exercises for various parameters that taught in the software as per break-up of module.

5: Mode of Examination as per teaching and evaluation scheme:

End Semester Sessional term work

6: List of Reference Books.

Help Manuals & Video Tutorials, as guided by the concerned faculty.

SEMESTER - II

Dr. BabasahebAmbedkar Technological University

First Year

Masters in Architecture - Environmental Architecture

Semester -2

Subject Codes	Subject	Teaching		Evaluation Scheme					Total	Credit
		Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE SV /STW		
MAREA10200001	Design Studio II (Energy Efficient)	2	6	50	50	0	0	150	250	5
MAREA10200002	Environmental and Ecological Planning	2	2	10	10	40	60	30	150	3
MAREA10200003	Climate Responsive Design -II	2	4	20	20	40	60	60	200	4
MAREA10200004	Energy Resource Management & Building Energy Management	2	4	40	40	0	0	120	200	4
MAREA10200005	Research Methodology	2	0	10	10	20	60	0	100	2
MAREA10200006	Elective-II	0	4	20	20	0	0	60	100	2
MAREA10200006A	GIS and Terrain Mapping									
MAREA10200006B	Eco Landscaping									
MAREA10200006C	Smart and Eco Cities									
	Total	10	20	150	150	100	180	420	1000	20

Design Studio II (Energy Efficient)							Semester-II	
SubjectCode– MAREA10200001								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESESV	Total	Credit
2	6	50	50	0	0	150	250	5

1: Learning Objectives.

To understand the application of building design principles for energy efficiency at site and building level.

2: Learning Outcomes

Students are expected to do critical study and application of concepts and strategies at input and output of Energy use. Calculations and quantitative supplementing of all strategies is also expected.

3: Teaching Modules

1. Built elements level (façade, openings, materials, etc.) – planning stage
2. Energy management level – operational stage
3. Technology level (building management and Intelligent buildings)– operations and maintenance stage

4: Exercises:

Retrofitting of a small scale commercial project in detail.

Design of medium scale building project in lieu of energy efficient building design. Eg. Commercial complex, Hotels, Hospitals, etc

5: Mode of Examination as per teaching and evaluation scheme:

Sessional work with Viva.

6: List of Reference Books.

- *Green Architecture, Design for a sustainable future*
- *Energy efficient buildings by Wagner Walter*
- *Energy Efficient Buildings in India by MilliMujumdar*
- *Energy Conservation Building Code (ECBC India)*
- *Handbook on Energy efficiency –ASHRAE Energy Use (4 Volumes) CIBSI Guide –Users Manual (U.K.)*
- *Energy Management: W.R.Murphy, G.MckayButterworths).*
- *Energy Conservation guide book Patrick/Patrick/Fardo (Prentice Hall)*
- *Handbook on Energy efficiency –*
 - a. *ASHRAEE Energy Use (4 Volumes)*
 - b. *CIBSI Guide –Users Manual (U.K.)*

Environmental and Ecological Planning							Semester-II	
SubjectCode– MAREA10200002								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESESTW	Total	Credit
2	2	10	10	40	60	30	150	3

1: Learning Objectives.

The purpose of this subject is to introduce to the students the basics of Ecological and Environmental systems, its importance and interdependence on each other

2: Learning Outcomes

To make the students understand the importance of land and ecological planning for sustainability, resource planning and allocation and protection of natural resources.

3: Teaching Modules

Unit I: Ecology.

1. Concept of Ecosystem, Type of Ecosystems, Components of an ecosystem, Earth Biomes & Climate Zones
2. Linkages and the cyclic flow of materials and energy. Biotic and a biotic components of an Ecosystem
3. Introduction to the concepts of Biodiversity,
4. Preservation and protection of important sensitive areas.

Unit 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.

Unit III: Site Development & Eco-System Preservation.

1. Development of sites/ land in accordance to their environmental properties.
2. Environmental clearance Reports
3. Recognizing environmental quality and deciding potential of Environmental planning at the site level.
4. Rehabilitation of degraded sites

Unit IV: Strategies

1. Eco friendly techniques for increasing land potential.
2. Landscaping and Plants

4: Exercises:

Reports and case studies are expected for the above topics.

5: Mode of Examination as per teaching and evaluation scheme:

Mid Semester and End Semester Theory Paper and End Semester Sessional term work.

6: List of Reference Books.

- *Cerver Francisco Asensio: Environmental restoration landscape.*
- *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 PrakashGole*

Climate Responsive Design -II - (Light and Ventilation)							Semester-II	
SubjectCode– MAREA10200003								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE STW	Total	Credit
2	4	20	20	40	60	60	200	4

1: Learning Objectives.

To understand the behaviour of Daylight, Wind, and Sound, and their application to achieve better climate responsive design strategies in all climatic conditions.

2: Learning Outcomes

Implementations of principles of daylight, wind and sound using passive design strategies to achieve human comfort in different building typologies.

3: Teaching Modules

Unit I - Day lighting and Architecture

Principles of daylighting, Photometric quantities, daylight factor, glare, prediction techniques, measurement and analysis of daylight, design strategies for daylighting.

Unit II – Artificial Lighting

Need, Light sources and ballast systems, Luminaires and light distribution, lighting controls, building level controls and integration with daylight, use of instruments to measure lighting levels, advance systems for daylight.

Unit III – Ventilation

Categories of ventilation, various technologies involved for Ventilation, Ventilation rate standards. Calculations involved in passive ventilation strategies.

Unit IV – Acoustics

Sound principles, Noise and noise control in various climates, Measurement and transmission, reverberation time, passive and active noise control, design strategies of acoustics for different functions.

4: Exercises:

Studies taken up by students individually and/or in groups will be presented in the format decided by teacher and submitted along with compilation of study material in the form of reports/notes/assignments.

5: Mode of Examination as per teaching and evaluation scheme:

Mid Semester Theory Paper and End Semester Theory Paper and End Semester Sessional work.

6: List of Reference Books.

1. *C Robbins; Daylighting: Design and Analysis*
2. *Helmut Koster; Dynamic Daylight Architecture*
3. *Benjamin Evans; Daylight in Architecture*
4. *Building Construction; B. C. Punmia*
5. *Building Construction_ S. C. Rangawala.*
6. *Manual of Tropical housing and climate by Koenisberger.*
7. *Climate responsive architecture by Arvind Krishnan*
8. *Manual of solar passive architecture - by Nayak J.K. R. Hazra J. Prajapati.*
9. *Sun Wind and Light-Architecture Design Strategies-by G.Z. Brown and Mark Dekay*
10. *Detailing for Acoustics-Duncan Templeton and Peter Lord*
11. *Acoustics in the building environment, Advice for the design team-Edited by Duncan Templeton*
12. *Acoustical Design of Concert halls and theatres-By William Lassen Jordan*
13. *Day Light in Architecture by Benjamin H. Evans, AIA*
14. *Day lighting Design and Analysis by Claude L. Robbins*
15. *The Lit Environment – by Derek Phillips*

Energy Resource Management & Building Energy Management							Semester-II	
SubjectCode– MAREA10200004								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESESV	Total	Credit
2	4	40	40	0	0	120	200	4

1: Learning Objectives.

1. To introduce the students to Energy as a Resource and appropriate technologies for harnessing it for benefit of earth and environment.
2. Building Energy Management at the operational and Maintenance level will also form a conclusion to deal with energy in buildings.

2: Learning Outcomes

Integration of energy management with planning and design of buildings.

3: Teaching Modules

Unit I: Renewable and alternate energy sources:

1. Global energy scenario and its status in India.
2. Renewable Source such as Solar, Wind, Biomass and other sources such as Geothermal, Tidal, Mechanical Nuclear Energy
3. Non Renewable Clean Source such as Nuclear, CNG, LPG.

Unit II: Technologies, storage and distributions:

1. Quantification of various technologies to convert, store and distribute energy produced from the above sources at site as well as building levels.
2. Cogeneration and hybrid systems (solar +wind, biomass solar) or use of various available energy sources to substitute specific uses in a building.
3. Case studies of the same at national and international levels.

Unit III Building Management System: Management as tool for reduction, Human and machine management, Threatsand Solutions, Architectural Intervention.

Unit IV User awareness and response: Building Users, Types and responses, Awareness program, role of users in Operations and Maintenance of Buildings for energy efficiency

Unit V Energy efficient systems and techniques: Energy Efficient HVAC systems, Plumbing Design, Illumination, Mechanical and Electrical transportation, Fire Fighting etc.

Unit VI Building Automation System: Introduction to building automation system, components and application of BAS, architectural implications.

4: Exercises:

Assignment will be in the form of a journal and small project showing the quantification of technologies learnt.

5: Mode of Examination as per teaching and evaluation scheme:

Sessional work with Viva.

6: List of Reference Books.

- *Energy efficient buildings by Wagner Walter*
- *Energy Efficient Buildings in India by MilliMujumdar.*
- *Solar Energy in Architecture and Urban Planning by Herzog Thomas*
- *Solar Heating, Design Process by Kreider Jan F*
- *Energy - Manual for college teachers (CEE publications)*
- *Renewable Energy & Environment - A policy analysis for India (CEE publications) Sustainable Building Design Manual-Volume I and II –TERI Publication*
- *Municipal Water and Waste Water Treatment – by Rakesh Kumar and R N Singh, edited by T.V.Ramchandra*
- *Natural Systems for Waste management & Treatment*
- *Renewable Energy and Environment - A policy analysis for India. (Publication from CEE).*
- *Energy Management: W.R.Murphy, G.Mckay (Butterworths).*
- *Energy Management Principles: C.B.Smith (Pergamon Press).*
- *Efficient Use of Energy : I.G.C.Dryden (Butterworth Scientific)*
- *Energy Economics -A.V.Desai (Wiley Eastern)*
- *Industrial Energy Conservation : D.A. Reay (Pergamon Press)*
- *Energy Management Handbook – W.C. Turner (John Wiley and Sons, A Wiley Interscience Publication)*
- *Industrial Energy Management and Utilization – L.C. Witte, P.S. Schmidt, D.R. Brown (Hemisphere Publication, Washington)*
- *Industrial Energy Conservation Manuals, MIT Press, Mass, 1982*
- *Energy Conservation guide book Patrick/Patrick/Fardo (Prentice Hall)*
- *Handbook on Energy efficiency –*
 - *ASHRAEE Energy Use (4 Volumes)*
 - *CIBSI Guide –Users Manual (U.K.)*

Research Methodology							Semester-II	
SubjectCode– MAREA10200005								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESESV /STW	Total	Credit
2	0	10	10	20	60	0	100	2

1: Learning Objectives.

To understand methods, processes and significance of research.

2: Learning Outcomes

To understand the importance of learning the techniques, methods of research and the process of writing a research paper. A draft research review related to environmental architecture.

3: Teaching Modules

Unit I: Introduction to the types and methods of research their relative advantages and disadvantages, the process of formulating a research.

Unit II: Probability and Distribution: Basic statistical concepts, Elements of Probability Examples, probability distributions, Binomial, Poisson and normal distributions.

Unit III: Sampling Techniques: Random sampling, simple random sampling and stratified random sampling, Non-sampling errors.

Unit IV: Correlation and Regression: Product moment correlation coefficient and its properties. Simple linear regression and multiple linear regressions, Statistical Inference: Statistical hypotheses, Error Types, level of significance, Chi-square Test.

Unit V: Introduction to methods of data collection, analysis and presentation.

Unit VI: Introduction to technical writing and presenting a research paper.

4: Exercises:

Finalizing topic of research and writing a draft research review of selected topics.

5: Mode of Examination as per teaching and evaluation scheme:

Mid Semester Theory Paper and End Semester Theory Paper

6: List of Reference Books.

- Creswell, J. W. *Research Design: Qualitative, quantitative and mixed methods approaches*, 2nd Ed., Thousand Oaks: Sage. 2003.
- *Statistics*, by Murray R Spiegel Larry J Stephens
- Groat, L. & Wang, D. *Architectural Research Methods*, NY: John Wiley and Sons Inc. 2002.
- Kothari, C.R. *Research Methodology: Methods and Techniques*, New Delhi: WishwaPrakashan. 2005.
- Sanoff, H. *Methods of Architectural Programming*, Dowden Hutchinson and Ross, Inc. Vol. 29, Community Development Series. 1977.

Elective – II							Semester-II	
SubjectCode– MAREA10200006								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE STW	Total	Credit
0	4	20	20	0	0	60	100	2
MAREA10200006A		GIS and Terrain Mapping						
MAREA10200006B		Façade Design						
MAREA10200006C		Smart and Eco Cities						

1: Learning Objectives.

Introduction to allied topics to increase the holistic approach towards environmental architecture.

2: Learning Outcomes

Understanding the selected topic and its application with respect to architecture.

3: Teaching Modules

1. GIS:

- Introduction to Geographic Information System.
- GIS Techniques & technology.
- Relating information from different sources, map projections, CAD drawings,
- 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.

2. Façade Design:

- Advanced techniques involved in facade designs eg kinetic facades, Bio mimicry Design etc.
- Facade designing for different building typologies eg. Tall Buildings, Sky scrapers etc.
- Case studies of the same done individually. Design of one small building typology.

3. Smart and Eco Cities

- Concepts of smart and eco cities.
- Detail study of different theories involved in planning and design of Smart and eco cities.
- Study of Policy level planning for the same.
- Comparison of different case studies

4: Exercises:

To generate reports and assignments done individually or in groups for selected topics. Exercises can be decided by faculty.

5: Mode of Examination as per teaching and evaluation scheme:

End Semester Sessional term work.

6: List of Reference Books.

- *Help Manuals & Video Tutorials, as guided by the concerned faculty.*
- *G.K.Brown and Mark DeKay ; Sun, Wind and Light, John Wiley and Sons, INC*
- *O.H.Koenigsberger; Manual of Tropical Housing & Building, University Press*
- *Arvind Krishnan: Climate Responsive Architecture*

SEMESTER - III

Dr. BabasahebAmbedkar Technological University

Second Year

Masters in Architecture - Environmental Architecture

Semester -III

Subject Codes	Subject	Teaching		Evaluation Scheme					Total	Credit
		Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE SV /STW		
MAREA20100001	Design Studio III	2	6	50	50	0	0	150	250	5
MAREA20100002	Dissertation I	2	4	40	40	0	0	120	200	4
MAREA20100003	Environmental Economics	2	0	10	10	20	60	0	100	2
MAREA20100004	Environmental Management systems & EIA	2	4	40	40	0	0	120	200	4
MAREA20100005	Law and Legislations for Environmental Control	2	2	10	10	40	60	30	150	3
MAREA20100006	Elective-III	0	4	20	20	0	0	60	100	2
MAREA20100006A	Sustainable Housing Policies									
MAREA20100006B	Contemporary Practices in Sustainable Architecture									
MAREA20100006C	Conservation as a tool for sustainability									
	Total	10	20	170	170	60	120	480	1000	20

Design Studio III (Sustainable Planning Studio)							Semester-III	
SubjectCode– MAREA20100001								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE SV	Total	Credit
2	6	50	50	0	0	150	250	5

1: Learning Objectives

The purpose of this Studio is to involve the students in small urban / environmental planning projects where they will be able to apply the theoretical knowledge of environmental & sustainability planning to a specific project.

2: Learning Outcomes

Students will look at urban development and identify environmental issues observed in urban areas and will give the proposal for the issues.

3: Teaching Modules

Unit –I Urban Environmental Assessments, Environmental Status Reporting and identification of environmental issues in selected urban areas.

Unit – II Conceptual master planning for Sustainable Development of neighborhoods, eco-sensitive areas etc.

Unit – II The theme of Urban Environmental Planning, which may include Riverfront development, ecological restoration projects, sustainable urban blocks, Heritage conservation for sustainability, Sustainable City Development Strategies etc.

4: Exercises:

Identification of area of intervention in report/PPT presentation format,

Conceptual or detailed presentations for the same depending upon the scale of the project,

Technical drawing portfolio and report to elaborate the sustainable design scheme.

5: Mode of Examination as per teaching and evaluation scheme:

End Semester Sessional Viva.

6: List of Reference Books.

- 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 Layards, *Planning for Sustainable future*
- D Farr, *Sustainable Urbanism*
- Tifiin J, *Transport communications*
- Brain, *Transport in Cities*

Dissertation I (Research Paper Writing)							Semester-III	
SubjectCode- MAREA20100002								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE SV/STW	Total	Credit
2	4	40	40	0	0	120	200	4

1: Learning Objectives

To give an opportunity to explore and to study central issues related to environmental architecture from past, to the present day and future.

2: Learning Outcomes

Each student should publish a Research Paper in recognized National / International Journal.

3: Teaching Modules

Unit –IThe topic of the research paper could be selected in a such way that it could help to develop an appropriate methodology and research approach may be related to the Dissertation Project taken up in semester-IV.

Unit – IIThe subject deals with selecting an appropriate topic from the field of environmental architecture or allied disciplines, for the theoretical exploration related and supportive to the selected dissertation topic.

Unit – III- Research dissertation based upon the topic approved by the institute in around 5000 words, in format specified by the university.

Unit-II- The student shall of a paper (in a conference / journal) on a topic of his/ her choice on any subject, he/ she have learnt in the course curriculum. The paper necessarily should be first authored by the student during the course of study.

The degree to the student will be awarded only after producing a proof of publication/ acceptance.

4: Exercises:

Research Paper and its publication no. and reference material file

5: Mode of Examination as per teaching and evaluation scheme:

End Semester Sessional term work.

6: List of Reference Books.

All books/ Journals/ Magazines/ unpublished thesis related to the topic selected by the individual student.

Environmental Economics							Semester-III	
SubjectCode– MAREA20100003								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE SV/STW	Total	Credit
2	0	10	10	20	60	0	100	2

1: Learning Objectives

To understand the Economics of Environmental and sustainable planning and development with various factors affecting the Price of Environmental Architectural projects as Green Products.

2: Learning Outcomes

This content aims to educate architects on understanding and making clients aware and understand how different Economics is when it comes to GREEN.

3: Teaching Modules

Unit –I: Economics for Planning.

Definition and scope of Economics and its importance in planning. Micro Economics, macro Economics. Theory of demand, supply, productions, costs revenue. Principle of taxation.

Unit –II: Theory and concepts of Environmental Economics.

Fundamentals of Environmental Economics, Basic Theory of Environmental Economics, Natural Resource Economics.

Unit III: Economics aspect of sustainable environmental planning

How economics is dealt in Sustainable development scenario.

Cost benefit analysis of raw material, technology used and finished building through its three stages of planning, construction and operational phases. Payback periods of materials, technologies and strategies used in buildings.

Unit IV: Economic instruments for pollution control

Price and pollution rights, the polluter pays and precautionary principles applied Rights, equity and participation principles applied

4: Exercises:

Comparing the case studies to understand environmental economics, Report

5: Mode of Examination as per teaching and evaluation scheme:

End Semester Theory Paper

6: List of Reference Books.

- Bottomore , T.B.P.Goode(eds) readings in Marxist Sociology,Oxford,Part 1City and Grassroots:A Cross Cultural Theoryof Urban Social Movements ,London
- Growth Economics by Amartya Sen.
- Economic and social development by S.L.Sinha
- Martin Gerald (2001): Human Ecology - Basic Concepts for Sustainable Development, Routledge, London .

Environmental Management systems & EIA (EIA, LCA, Carbon Footprint and Mapping, Green Building Rating systems)							Semester-III	
Subject Code- MAREA20100004								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE SV	Total	Credit
2	4	40	40	0	0	120	200	4

1: Learning Objectives

To introduce the various tools and methods associated with the field of environment and sustainability, to prepare students for new skills and upcoming trends in the field of environment.

2: Learning Outcomes

Understanding various tools of sustainability and use those to measure environmental impact of processes

3: Teaching Modules

Unit – I: Introduction to ECBC and Green Building Rating Systems: Different rating systems in India in Detail

Unit –II: Energy Management Systems (ISO 14000) Documents, Processes involved and Case studies related.

Unit –III: Life Cycle Assessment : Concept and Processes involved and Case studies related.

Unit – IV: Carbon Footprint and Mapping: Concept and Processes involved and Case studies related.

** This list is not exhaustive and further topics could be added if required over time.*

4: Exercises:

Assignment will be in the form of notes/assignments covering all the topics mentioned above with suitable examples, sketches and supportive material.

5: Mode of Examination as per teaching and evaluation scheme:

End Semester Sessional Viva

6: List of Reference Books.

- GRIHA; Griha Manual, Vol 1 to 5, TERI Publication
- IGBC Manuals, CIIPublication
- LEED Manuals
- ECBC Manual

Law and Legislations for Environmental Control							Semester-III	
SubjectCode– MAREA20100005								
Teaching		Evaluation Scheme					Total	Credit
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE STW		
2	2	10	10	40	60	30	150	3

1: Learning Objectives

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

2: Learning Outcomes

To understand different laws in the field of environment and accordingly protect the environment.

3: Teaching Modules

Unit -I: Introduction to Law and Legislations and Protocols with respect to Environment

Public Health and Safety: Remedies under law of torts, law of crimes and other commonlaw remedies. The Constitution of India: Salient features, Fundamental Rights and Directive Principles of State Policy, Writ petitions, Public Interest Litigation.

International treaties such as Kyoto Protocol, Montreal Protocol, their ratification & local laws for implementation. Environmental Policies and Programmes – International and National (Policies)

Unit –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

Unit III: Environmental Notifications

Costal Regulation Zones, Dahanutaluka 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.

4: Exercises:

Assignment will be in the form of notes/assignments covering all the topics mentioned above with suitable examples, sketches and supportive material.

End Semester Theory examination and sessional assessment.

6: List of Reference Books.

- *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 IGDR 97*

Elective III							Semester-III	
SubjectCode– MAREA20100006								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE SV	Total	Credit
0	4	20	20	0	0	60	100	2
MAREA20100006A		Sustainable Housing Policies						
MAREA20100006B		Contemporary Practices in Sustainable Architecture						
MAREA20100006C		Conservation as a tool for sustainability						

1: Learning Objectives

To understand the sustainability from different fields related to architecture.

2: Learning Outcomes

Observation of sustainability case studies of selected topic and its application in architecture field.

3: Teaching Modules

1. Sustainable Housing Policies

- Introduction to Housing related problems
- Study of Sustainable housing policies in India or globally
- Case studies related to sustainable housing individually

2. Contemporary Practices in Sustainable Architecture (Architects Work)

- Introduction to Contemporary practices.
- Different architects of the same period and their sustainable practices.
- Indian Individuals: Contribution of Indian individuals such as Laurie Baker, YatinPandya, Anil Lul, M.N AshishGanjuetc in the form of their ideas, Philosophies and their work.
- Foreign Individuals: Contribution of Foreign individuals such as Geoffrey Bawa, Hassan Fathi, Moshe Safdi, etc in the form of their ideas, Philosophies and their work.

3. Conservation as a tool for sustainability

- Ecology of various natural Ecosystems such as Ecology of fishes, Wildlife Ecology & Conservation, Soil Ecology, Agro ecosystems etc, Fundamentals of Environmental Law, Climate Change – Its indicators and effects.
- Land Use and Global Change, Economics of Environment and Development, Environmental Security and Conflict, Analysis and Modeling of Ecological Data. Ecological Risk Assessment
- Introduction to Resource Conserving Architecture

4: Exercises:

Assignment will be in the form of notes/assignments covering all the topics decided by the teacher with suitable examples, sketches and supportive material.

5: Mode of Examination as per teaching and evaluation scheme:

End Semester Sessional assessment.

6: List of Reference Books.

- *Energy Efficient Buildings in India* by Milli Mujumdar Green is Red by Anil Lal
- *Publications from - CBRI - Roorkee*
- *-IDC - Mumbai*
- *-NID - Ahmedabad*
- *Green Architecture, Design for a sustainable future*
- *Ecology and Environmental Planning, Edington, John*
- *The Environment, Public Health and Human Ecology consideration for Economic Development Environmental Policies and Programs in India, Saksena, K.D.*
- *Sustainable Building Design Manual-Volume I and II –TERI Publication*
- *Energy - Manual for college teachers (CEE publications)*
- *Martin Gerald (2001): Human Ecology - Basic Concepts for Sustainable Development, Routledge, London.*

SEMESTER - IV

Dr. BabasahebAmbedkar Technological University**Second Year****Masters in Architecture - Environmental Architecture****Semester -4**

Subject Codes	Subject	Teaching		Evaluation Scheme					Total	Credit
		Theory	Studio	CA1	CA 2	MS E	ESE Paper	ESESV /STW		
MAREA2 0200001	Dissertation II (Environmental Architecture / Planning)	0	20	100	100	0	0	300	500	10
MAREA2 0200002	Energy Audit and ECBC	0	4	20	20	0	0	60	100	2
MAREA2 0200003	Professional Training (Six week)	0	0	0	0	0	0	100	100	2
	Total	0	24	120	120	0	0	460	700	14
Note	Six week training should be done in vacation of third semester and certificate needs to be produced									

- Final Degree Class / Division and Marks / Percentage / Credits / Grade needs to be given as average score of all 4 Semesters, with Absolute Grading.
- Each student should publish a Research Paper in recognized National / International Journal during the Second Year of Masters. The research paper should be related to the Dissertation topic selected for Semester 4 of the Second year.
- The impact factor of the journal should be 1 and above.

Dissertation II (Environmental Architecture / Planning)							Semester-IV	
SubjectCode– MAREA20200001								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE SV	Total	Credit
0	20	100	100	0	0	300	500	10

1: Learning Objectives

To give an opportunity to the student to explore a practical or conceptual project related to environmental planning or design

2: Learning Outcomes

Students to come up with a policy and design level proposal for the same.

3: Teaching Modules

Unit - I: The student has a choice to focus on the planning and policy aspect, or the dissertation could culminate in a design of a sustainable built form.

1. Each student is required to select an independent study with reference to a special topic in Environmental Architecture, before the end of third semester in consultation with the faculty members.
2. Identification of the project with its significance, scope and limitations
3. Programming research related to the project and evolving the project brief
4. Preparing a project proposal and presenting it in graphical and textual format.

4: Exercises:

The document including report, computer simulation results and technical drawing if required. The work will be in the form of necessary drawings to explain the project and its details. A comprehensive report of the project and the related study, will be submitted which will include the above drawings.

5: Mode of Examination as per teaching and evaluation scheme:

End Semester Sessional Viva Examination.

6: List of Reference Books.

List of reference books related to topic selected is expected in the black book of dissertation.

Energy Audit and ECBC							Semester-IV	
SubjectCode– MAREA20200002								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE STW	Total	Credit
0	4	20	20	0	0	60	100	2

1: Learning Objectives

To study ECBC and Energy auditing processes involved in different areas.

2: Learning Outcomes

After getting thorough knowledge of energy this study can give a complete practice oriented output.

3: Teaching Modules

Unit - I:

1. Study of development of various building codes at national and international level, objectives, key features, role and application.
2. Energy conservation in buildings: Study of Energy conservation in buildings, Energy conservation Building Code(ECBC, India), Role and objectives of energy conservation building codes and rating systems.

Unit – II:

Indian scenario in Energy conservation of buildings, various stakeholders involved, role of stakeholders, role of Indian government in successful implementation of codes and rating systems.

Unit – III:

EnergyAudit: Documents, Processes involved and Case studies related.

4: Exercises:

Assignment will be in the form of notes/assignments covering all the topics decided by the teacher with suitable examples, sketches and supportive material. One live individual case study for ECBC and Energy Audit.

5: Mode of Examination as per teaching and evaluation scheme:

End Semester Sessional term work.

6: List of Reference Books.

- *Energy Management: W.R.Murphy, G.Mckay Butterworths).*
- *Energy Management Principles: C.B.Smith (Pergamon Press).*
- *Efficient Use of Energy : I.G.C.Dryden (Butterworth Scientific)*
- *Energy Economics -A.V.Desai (Wiley Eastern)*
- *Industrial Energy Conservation : D.A. Reay (Pergamon Press)*
- *Energy Management Handbook – W.C. Turner (John Wiley and Sons, A Wiley Interscience Publication)*
- *Industrial Energy Management and Utilization – L.C. Witte, P.S. Schmidt, D.R. Brown (Hemisphere Publication, Washington)*
- *Industrial Energy Conservation Manuals, MIT Press, Mass, 1982*
- *Energy Conservation guide book Patrick/Patrick/Fardo (Prentice Hall)*
- *Handbook on Energy efficiency –ASHRAEE Energy Use (4 Volumes) CIBSI Guide –Users Manual (U.K.)*

Professional Training (Six week)							Semester-IV	
SubjectCode– MAREA2020003								
Teaching		Evaluation Scheme						
Theory	Studio	CA1	CA2	MSE	ESE Paper	ESE STW	Total	Credit
0	0	0	0	0	0	100	100	2

1: Learning Objectives

To give an opportunity for learning and for development of skills related to practical aspects of the discipline of Environmental Architecture, by working in a firm/organization working in the field of environment.

2: Learning Outcomes

To give an insight into the practical applications of the technical know-how.

3: Teaching Modules

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 in India or abroad.

4: Exercises:

Training report along with a long book

5: Mode of Examination as per teaching and evaluation scheme:

End Semester Viva Examination.

6: List of Reference Books.

NA