VISVESVARAYA TECHNOLOGICAL UNIVERSITY,
BELAGAVI.

Scheme of Teaching and Examinations and Syllabus
M. Arch. (Sustainable Humane Habitat) (Effective from Academic year 2020-21)

MASTERS OF ARCHITECTURE,
M.Arch. (Sustainable Humane Habitat)

ईशा वास्यम् इदं सव यत् कञ्च जगत्यां जगत् ।
तेन त्यक्तेन भुञ्जीथा मा गृधः कस्य ि्स्वद्धनम् ॥ १ ॥

īśā vāsyam ida**ṃ** sarva**ṃ** yat kiñca jagat**yāṃ** jagat |
tena tyaktena bhuñjīthā mā g**ṛ**dha**ḥ** kasya sviddhanam || 1 ||

All this is for habitation by the Lord, whatsoever is individual universe of movement in the universal motion. By that renounced thou shouldnt enjoy; lust not after any man's possession.

- Isha Upanishad

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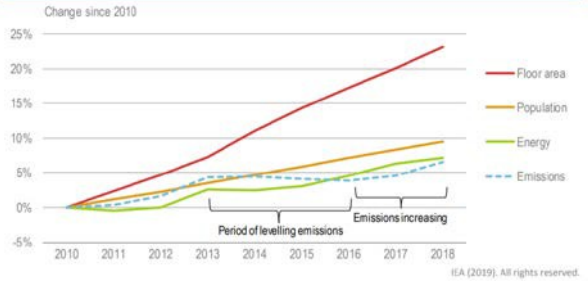
1. INTRODUCTION

The world is getting populated day by day & it's getting richer at an even faster rate. This rich world is transforming luxuries of the past into necessities of the present. The increasing number of Buildings, cars or ACs is not the problem; the problem is with the amount of energy they are consuming. The difference between potential demand & the available supply of energy resources is rising rapidly.

As per the International Energy Agency (IEA), The buildings and buildings construction sectors combined are responsible for over one-third of global final energy consumption and nearly 40% of total direct and indirect CO2 emissions. Energy demand from buildings and buildings construction continues to rise, driven by improved access to energy in developing countries, greater ownership and use of energy-consuming devices, and rapid growth in global buildings floor area.

Figure 1 • Changes in floor area, population, buildings sector energy use and energy-related emissions globally, 2010-18

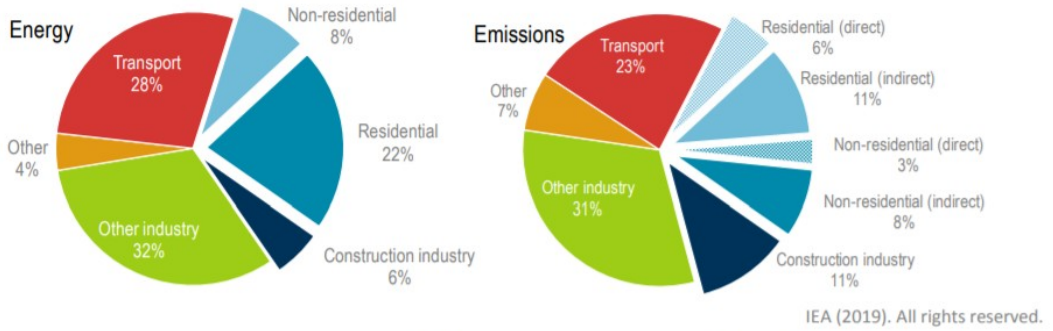


Source: Derived from IEA (2019a), *World Energy Statistics and Balances 2019*, www.iea.org/statistics and IEA (2019b) *Energy Technology Perspectives*, buildings model, www.iea.org/buildings.

Energy and emissions in the buildings and construction sector

Building construction and operations accounted for the largest share of both global final energy use (36%) and energy-related CO_2 emissions (39%) in 2018 (Figure 2).

Figure 2 • Global share of buildings and construction final energy and emissions, 2018



Notes: *Construction industry* is the portion (estimated) of overall industry devoted to manufacturing building construction materials such as steel, cement and glass. Indirect emissions are emissions from power generation for electricity and commercial heat.

Sources: Adapted from IEA (2019a), *World Energy Statistics and Balances* (database), www.iea.org/statistics and IEA (2019b), *Energy Technology Perspectives,* buildings model, www.iea.org/buildings.

Key message • The buildings and construction sector should be a primary target for GHG emissions mitigation efforts, as it accounted for 36% of final energy use and 39% of energy- and process-related emissions in 2018.

Architects are responding to the situation with sustainable design strategies that reduce energy consumption and minimize damage to the environment.

When the amount of energy used by buildings across the globe is considered, it becomes obvious that sustainable architecture and design are extremely important.

K S School of Planning and Architecture wishes to introduce this unique course, which will bring together an amalgamation of practice and education, thus making the individual capable to handle the Sustainable planning and design in a more efficient way.

About the Programme

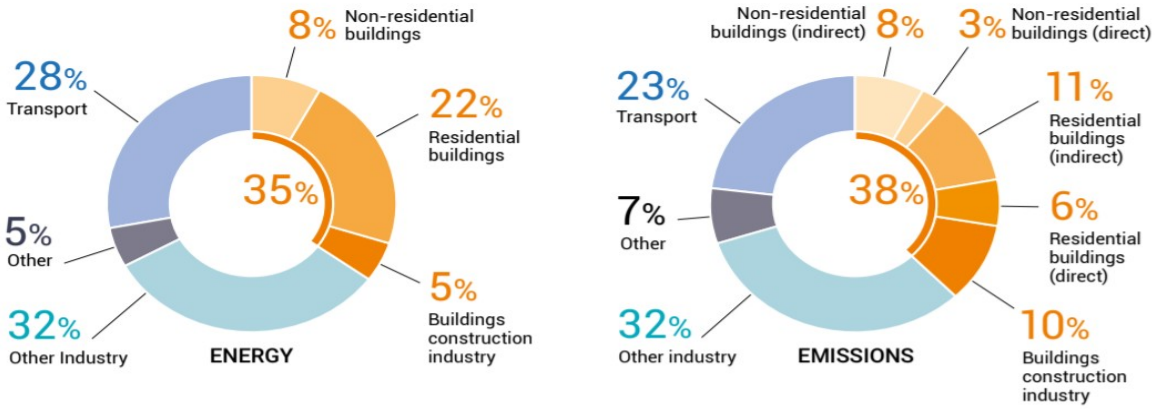
This programme aims to begin with review of the context, motivation, and principles necessary to put sustainable design into practice along with Traditional Sustainable components. Students to begin with semester with Integrated Design studio, followed by Dialogue based (role play) courses to expose them to position of different stake holders. The programme then jumps scale to study the practices needed to green cities including eco-districts, eco-villages and more. The students also deal with Life cycle cost, Environmental economics and development laws.

2. NEED OF THE PROGRAMME

India has made important progress towards meeting the United Nations Sustainable Development Goals, notably Goal 7 on delivering energy access. Both the energy and emission intensities of India's gross domestic product (GDP) have decreased by more than 20% over the past decade. This represents commendable progress even as total energy related carbon dioxide (CO2) emissions continue to rise.

Based on current policies, India's energy demand could double by 2040, with electricity demand potentially tripling as a result of increased appliance ownership and cooling needs.

Global share of buildings and construction final energy and emissions, 2019



Notes: Buildings construction industry is the portion (estimated) of overall industry devoted to manufacturing building construction materials such as steel, cement and glass. Indirect emissions are emissions from power generation for electricity and commercial heat.

Sources: (IEA 2020d; IEA 2020b). All rights reserved. Adapted from "IEA World Energy Statistics and Balances" and "Energy Technology Perspectives".

The buildings sector emission increase is due to a continued use of coal, oil and natural gas for heating and cooking combined with higher activity levels in regions where electricity remains carbon-intensive, resulting in a steady level of direct emissions but growing indirect emissions (i.e. electricity). Electricity consumption in building operations represents nearly 55% of global electricity consumption.

The rapid pace at which resource consumption is increasing in every field, it has become essential to consider the idea of sustainability in all aspects. Buildings are the larger consumer of resources. The Buildings need to be more and more efficient in making the best use of resources during the construction process and also in its lifetime. Hence, to make the Architects and Engineers more sensitive towards effective sustainable practices this programme is important.

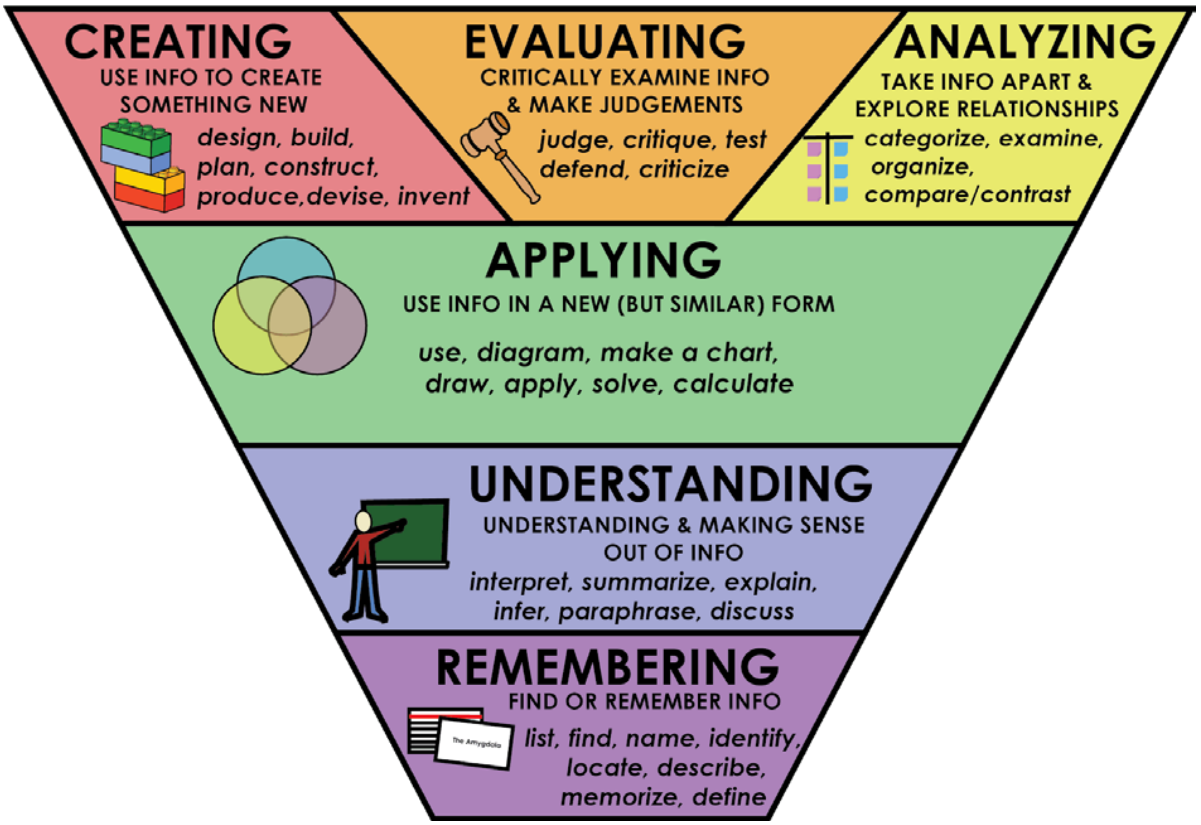
3. PEDAOGOGY

The programme will be a combination of lectures, workshops, practical's, site works, lab work and studio works. Students will get an opportunity to work on the sites to gain valuable experiences throughout the programme. In deliberating on what should be the focus areas for multi-disciplinary curricula, certain considerations need to be kept in mind:

- Content should have a good mix of theory and practice including the latest technological innovations in the field.
- The programme shall be able to bridge the gaps between the theoretical knowledge and its implication on the site.
- Focus shall be given to the Sustainable values and practices.
- The gap between current needs and knowledge of the faculty in the field of planning, management, and development skills needs to be identified.
- Newer technologies shall be introduced for the betterment of society in terms of lower energy consumptions using effective and efficient design solutions leading to sustainable practices.

Higher Order Thinking Skills (HOTS)

The programme adopts Higher Order Thinking Skills (HOTS) based outcome analysis. It distinguishes critical thinking skills from low-order learning outcomes, such as those attained by rote memorization. HOTS include synthesizing, analyzing, reasoning, comprehending, application, and evaluation.



Programme outcome

- The course will combine the ethics and philosophy of sustainability.
- Analyze the origins and founding principles of sustainability.
- Combine the cultural, ecological, economic and experiential forces into holistic frameworks for sustainability.
- Analyze the state of the local, National and International energy and environmental systems and value the critical role of built environment professionals in responding to that challenge.
- Identify the critical methodologies used to achieve high levels of sustainability in the design and construction of the built environment including: Integrated project delivery; Integrated design charrettes; Building simulation; Life cycle analysis; BIM; and Green construction practices.

4. PROGRAMME DETAILS

Title: Masters of Architecture (Sustainable Humane Habitat)

Eligibility:

Admission to M.Arch Programme shall be open to the candidates who have passed Bachelor of Architecture (B.Arch.) with not less than 50% of the marks in the aggregate of all the years of the degree examination.

However, in the case of candidates belonging to SC/ ST and Category I, the aggregate percentage of marks in the qualifying examinations shall not be less than 45% Rounding off of percentage secured in qualifying examination is not permissible..

Admission Requirements:

i. For admissions under GATE (Architecture) qualification and roaster system of Government of Karnataka:

The candidates should be GATE (Architecture) qualified or should have appeared for the Entrance Examination conducted by Karnataka Examinations Authority (KEA) by Government of Karnataka / VTU/ any other University on approval by Government of Karnataka.

ii. For admissions under Management Quota:

a. The candidates should be GATE (Architecture) qualified or should have appeared for the Entrance Examination conducted by Karnataka Examinations Authority (KEA) by Government of Karnataka / VTU/ any other University on approval by Government of Karnataka.

b. There shall be an Admissions Committee for the M.Arch programme/s in each College consisting of the Principal of the College as the Chairman, Head of the concerned Department, one senior faculty of the concerned Department or Subject Experts as members. The Admissions Committee conducts the interview and selects the candidates for admissions.

iii. iii. For admissions under Sponsored Quota:

The candidates should be GATE (Architecture) qualified or should have appeared for the Entrance examination conducted by Karnataka Examinations Authority (KEA) , Government of Karnataka / VTU/ any other University on approval by Government of Karnataka.

Programme Prospects:

Career opportunities are diverse as follows:

- Centre and State Government Bodies
- Private Organizations,
- Consulting Companies or
- City Municipalities
- MNCs, etc
- Postgraduates may even plan to pursue research work and pursue Ph.D. in related advanced areas.

Salient Features of the programme: The programme is under four pedagogical features, based on learning parameters of every semester. The combination of these four pedagogical structures throughout the semester will develop a base and make the student understand the application of Sustainability in the practice.

PEDAGOGICAL FEATURES	CONTENTS
Theoretical base and framework	Understanding the theories and philosophies associated with understanding the Sustainability, paradoxes of development, Environment economics, and city & region scale ecology form the basics of the course.
Technical support	Understanding the ecology design and technique, Value proposition technique, Green building concepts, Disaster management, softwares focuses majorly on interpretation and analysis.
Management	Focuses majorly on the management and operations on the management system controls, Business sustainability and resilience, Development laws. With theoretical base and its implementation through technical support, the students deal with the sustainable management.
Application	Integrated design studios, Debate and Role play, Augmented case study, with seminars and workshops gives a student better understanding on its application part.

Programme Guidelines

- The University shall conduct an examination at the end of each semester or academic year as per the scheme of examination.
- The sessional work, project, design, research shall be assessed with progressive marking throughout the semester. (refer M.Arch Regulations 2020-21; 20-OMA 6.1).
- Attendance requirement to be followed as per the M.Arch Regulations 2020-21; 20-OMA 5.0.
- Dissertation/Thesis project to be followed as per the M.Arch Regulations 2020-21; 20-OMA 10.0.

Structure of the Programme

The Programme is a full time programme and shall extend over a period of four semesters and each semester (excluding Examination, Professional training and Vacation) shall be of 16 weeks duration.

Internship

Internship Requirements: All the students have to undergo mandatory internship of 8 weeks during the vacation between II and III semesters. A University examination shall be conducted during III semester and the prescribed internship credit shall be counted for the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. The students are required to submit periodic progress reports of the internship undertaken.

Internship Assessment: CIE marks shall be awarded by a committee comprising of Dean and PG course/HoD. The CIE marks awarded for Internship, shall be based on the evaluation of Internship Report, Internship Presentation skill and performance in Question and Answer session in the ratio 50:25:25. Those, who have not pursued /completed the internship shall be declared as fail in internship course and have to complete the same during subsequent University examinations after satisfying the internship requirements. Internship SEE (University examination) shall be as per the University norms.

Thesis Project

CIE marks shall be awarded by a committee comprising of Principal/Dean, PG Coordinator/HOD and Guide/Co-guide of the department. The CIE marks awarded for Thesis project, shall be based on the evaluation of Thesis Report, Thesis Presentation skill and performance in Question and Answer session in the ratio 50:25:25.

SEE shall be at the end of IV semester. Dissertation work evaluation and Viva-Voce examination (SEE), after satisfying the plagiarism check, shall be as per the University norms.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2020 - 21
M.Arch. (SUSTAINABLE HUMANE HABITAT)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

I SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours /Week				Examination					Credits
				Lecture	Studio	Skill Development Activities	Total hours	Duration in hours	CIE Marks	SEEMarks		Total Marks	
										Theory	Viva voce		
				L	S	SDA							
1	PCC	20ASH11	INTEGRATED SUSTAINABLE STUDIO- I	5	5	5*	10	Min. 30 mins/ student	40	-	60	100	10
2	PCC	20ASH12	INTRODUCTION TO SUSTAINABILITY AND ENVIRONMENT	1	-	1	2	3	40	60	-	100	2
3	PCC	20ASH13	SUSTAINABILITY AND PARADOX OF DEVELOPMENT	2	1	-	3	3	40	60	-	100	3
4	PCC	20ASH14	ECOLOGY OF CITY & REGION	1	1	-	2	3	40	60	-	100	2
5	PSC	20ASH15	COMMUNITY, NATURE AND LIVEABILITY.	3	-	-	3	3	40	60	-	100	3
6	PSC	20ASH16	ECOLOGICAL DESIGN AND TECHNIQUE	1	1	1	3	3	40	60	-	100	2
7	PSC	20ASH17	DIALOGUE BASED AUGMENTED CASE STUDY	1	1	1	3	--	100	-	-	100	2
8	PE	20ASH18X	PROFESSIONAL ELECTIVE- I	2	-	-	2	-	100	-	-	100	2
			TOTAL	16	9	3	28	15	440	300	60	800	26

Note: PCC: Professional Core Course, PSC: Professional Support Course, PEC: Professional Elective Course.

Professional Elective I (Choose any one)

Course Code (under 20ASH18X)	Course title
20ASH18A	PROFESSIONAL ELECTIVE A - URBAN DESIGN AND INFRASTRUCTURE
20ASH18B	PROFESSIONAL ELECTIVE B- IMPACTS OF REAL ESTATE

Note:

1. 1 Lecture Hour - 1 Credit. 2 Studio Hours - 1 Credit. 2 Workshop Hour - 1 Credit
2. Skill Development Activities:. *SDA Hours are dedicated for the students to carry out site visits, library reading, software practice, etc. Hence they are not calculated under contact hours but credits are allocated.
3. Viva voce: The viva voce shall be conducted for a duration of minimum of 30 minutes (per student) for the courses listed under viva voce for all the semesters.

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M.Arch. (SUSTAINABLE HUMANE HABITAT)
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II SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours /Week				Examination					Credits
				Lecture	Studio	Skill Development Activities	Total hours	Duration in hours	CIE Marks	SEEMarks		Total Marks	
										Theory	Viva voce		
				L	S	SD							
1	PCC	20ASH21	INTEGRATED DESIGN STUDIO - II	5	5	5*	10	Min. 30 mins/ student	40	-	60	100	10
2	PCC	20ASH22	VALUE PROPOSITION MANAGEMENT & ANALYTICAL TECHNIQUES	3	-	-	3	3	40	60	-	100	3
3	PCC	20ASH23	ECOLOGICAL ARCHITECTURE	3	-	-	3	3	40	60	-	100	3
4	PCC	20ASH24	ACTIVISM & INNOVATION IN ECOLOGICAL PERSPECTIVE	3	-	-	3	3	40	60	-	100	3
5	PCC	20ASH25	GREEN BUILDINGS CONCEPT RATING SYSTEM	3	-	-	3	3	40	60	-	100	3
6	PCC	20ASH26	URBANISATION AND SUSTAINABILITY	2	-	-	2	3	40	60	-	100	2
7	PSC	20ASH27	RESEARCH METHODOLOGY & IPR	1	1	1	3	3	40	60	-	100	2
8	PEC	20ASH28X	PROFESSIONAL ELECTIVE II	1	1	1	3	--	100	-	-	100	2
			TOTAL	21	7	2	30	18	380	360	60	800	28

Note: PCC: Professional Core Course, PSC: Professional Support Course, PEC: Professional Elective Course.

Professional Elective II (Choose any one)

Course Code (under 20ASH28X)	Course title
20ASH28A	PROFESSIONAL ELECTIVE A - TRADITIONAL KNOWLEDGE SYSTEM
20ASH28B	PROFESSIONAL ELECTIVE B - DESIGING WITH NATURE

Note:

1. 1 Lecture Hour - 1 Credit. 2 Studio Hours - 1 Credit. 2 Workshop Hour - 1 Credit
2. Skill Development Activities:. *SDA Hours are dedicated for the students to carry out site visits, library reading, software practice, etc. Hence they are not calculated under contact hours but credits are allocated.
3. Viva voce: The viva voce shall be conducted for a duration of minimum of 30 minutes (per student) for the courses listed under viva voce for all the semesters.
4. Dialogue Based :The discussions and evaluation shall be conducted for a duration of minimum of 30 minutes (per student) internally.
5. Internship Requirements: All the students have to undergo mandatory internship of 8 weeks during the vacation between II and III semesters. A University examination shall be conducted during III semester and the prescribed internship credit shall be counted for the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. The students are required to submit periodic progress reports of the internship undertaken.

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M.Arch. (SUSTAINABLE HUMANE HABITAT)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

III SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours /Week				Examination					Credits
				Lecture	Studio	Skill Development Activities	Total hours	Duration in hours	CIE Marks	SEEMarks		Total Marks	
										Theory	Viva voce		
				L	S	SDA							
1	PCC	20ASH31	SUSTAINABLE MANAGEMENT & DESIGN STUDIO (SMART)	5	5	5*	10	Min.30 mins/ student	40	-	60	100	10
2	PCC	20ASH32	SUSTAINABLE MANAGE SYSTEM AND CONTROL	1	1	1	3	3	40	60	-	100	2
3	PCC	20ASH33	ADMINISTRATION, GOVERNANCE AND IMPLEMENTATION IN SUSTAINABILITY	1	1	1	3	3	40	60	-	100	2
4	PCC	20ASH34	LIFE CYCLE ANALYSIS (PROJECT & PRODUCT)	2	1	1	4	3	40	60	-	100	3
5	PCC	20ASH35	ENVIRONMENTAL ECONOMICS	1	1	1	3	3	40	60	-	100	2
6	PCC	20ASH36	BUSINESS SUSTAINABILITY & RESILIENCE	2	1	1	4	3	40	60	-	100	3
7	PEC	20ASH37X	PROFESSIONAL ELECTIVE III	1	1	1	3	-	100	-	-	100	2
8	PST	20ASH38	PROFESSIONAL TRAINING / INTERNSHIP	-	-	-	-	Min 30 mins/ student	-	-	100	100	2
			TOTAL	13	11	6	30	15	340	300	160	800	26

Note: PCC: Professional Core Course, PSC: Professional Support Course, PEC: Professional Elective Course, PST: Professional Support Training.

Professional Elective III (Choose any one)

Course Code (under 20ASH37X)	Course title
20ASH37A	PROFESSIONAL ELECTIVE A - SUSTAINABLE DEVELOPMENT LAWS IN INDIA
20ASH37B	PROFESSIONAL ELECTIVE B - EMERGING GLOBAL SCENARIO
20ASH37C	PROFESSIONAL ELECTIVE C - PLANNING FOR ECO-TOURISM

Note:

1. 1 Lecture Hour - 1 Credit. 2 Studio Hours - 1 Credit. 2 Workshop Hour - 1 Credit
2. Skill Development Activities:. *SDA Hours are dedicated for the students to carry out site visits, library reading, software practice, etc. Hence they are not calculated under contact hours but credits are allocated.
3. Viva voce: The viva voce shall be conducted for duration of minimum 30 minutes (per student) for the courses listed under viva voce for all the semesters.
4. Internship Requirements: All the students have to undergo mandatory internship of 8 weeks during the vacation between II and III semesters. A University examination shall be conducted during III semester and the prescribed internship credit shall be counted for the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. The students are required to submit periodic progress reports of the internship undertaken.
5. Internship Assessment: CIE marks shall be awarded by a committee comprising of Dean and PG course/HoD. The CIE marks awarded for Internship, shall be based on the evaluation of Internship Report, Internship Presentation skill and performance in Question and Answer session in the ratio 50:25:25. Those, who have not pursued /completed the internship, shall be declared as fail in internship course and have to complete the same during subsequent University examinations after satisfying the internship requirements. Internship SEE (University examination) shall be as per the University norms.

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IV SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours /Week				Examination					
				Lecture	Studio	Skill Development Activities	Total hours	Duration in hours	CIE Marks	SEEMarks		Total Marks	Credits
										Theory	Viva voce		
				L	S	SDA							
1	PCC	20ASH41	THESIS PROJECT	5	10	16*	15	Min 30 mins / students	40	-	60	100	18
2	PCC	20ASH42	DISASTER MITIGATION & MANAGEMENT	1	1	1	3	3	40	60	-	100	2
			TOTAL	6	11	1	18	3	80	60	60	200	20

Note: PCC: Professional Core Course, PSC: Professional Support Course, PEC: Professional Elective Course.

Note:

1. 1 Lecture Hour - 1 Credit. 2 Studio Hours - 1 Credit. 2 Workshop Hour - 1 Credit
2. Skill Development Activities:. *SDA Hours are dedicated for the students to carry out site visits, library reading, software practice, etc. Hence they are not calculated under contact hours but credits are allocated.
3. Viva voce: The viva voce shall be conducted for a duration of minimum of 30 minutes (per student) for the courses listed under viva voce for all the semesters.
4. Thesis project: CIE marks shall be awarded by a committee comprising of Principal/Dean, PG Coordinator/HOD and Guide/Co-guideof the department. The CIE marks awarded for Thesis project, shall be based on the evaluation of Thesis Report, Thesis Presentation skill and performance in Question and Answer session in the ratio 50:25:25. SEE shall be at the end of IV semester. Dissertation work evaluation and Viva-Voce examination (SEE), after satisfying the plagiarism check, shall be as per the University norms.

INTEGRATED SUSTAINABLE STUDIO - I			
Course Code	20ASH11	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	05:05:05	SEE Marks	60
Credits	10	Exam Hours	Min. 30 mins/student

Objectives

The Course aims to allow the students to develop a design solution that is sustainable on a small scale, that looks at it as a team exercise of 2-4 persons. The project will aim to provide a design solution that addresses three criteria - financial constraint from a profitability standpoint, environmental from a least impact standpoint, while providing a strong livability index for the user.

Modules/Outline

1. Create a real world problem with a go to market strategy for a small scale building project with the following goals:
    a. Environmental impact - aim to keep it low - with strong use of passive solutions and select use of active solutions and good response to natural parameters.
    b. Economically viable - should be profitable - if a greater cost is invested in it, there should be improved returns to justify the investment unless it is a basic market standard.
    c. Liveability and lifestyle choices - the more the better to improve the customer satisfaction, but finding the point where this balances the cost and environmental impact is critical.

2. Project deliverables:
    a. Start by defining a problem statement and target market - and submit (1 week)
    b. Do a benchmarking case study for similar projects locally and from around the world - and submit (2 weeks)
    c. Develop a business plan, an environmental response plan and liveability index on a measurable scale as a rating for the project (4 weeks)
    d. Create a design solution that will satisfy as much of the key goals of the project. (5 weeks)
    e. Staff will evaluate the technical competence of the project on each of the three areas and work with the students to optimize design (1 week)
    f. Teams will then evaluate each other's performance - to see if they have achieved the performance benchmarks set for themselves in the planning stage - as a potential customer by rating their achievement against targeted benchmarks. (1 week)
    g. Staff will moderate the “customer responses” and evaluate all stages together to provide a final score after customer feedback is incorporated in the design. (2 week)

Course outcomes:

1. The design project will take them through a whole project journey from formulation of a project idea to taking it to market, evaluating it and presenting it to customers and the client management team.
2. The aim is to understand effectively the process, analysing the changing circumstances and findings along the way.
3. To realize that the goals set at the beginning may have to change and evolve and be interpreted differently by the time the project solution is arrived at, but that the goals are still achievable to a large extent.
4. The importance of measurable outcomes and justifiable decisions on projects related to sustainable design.

Viva pattern:
• The exam shall be conducted as a panel jury exam which shall be minimum of 30mins/ student, where the student shall present the work in the form of sheets. • Discussions, presentations, and studies will cover all the topics. • The portfolio covering all the assignments shall be presented for term work.
Text/ Reference Books
Sustainable Design Architecture, Planning, and Ecology by Orr, David W., Williams, Wiley; 1st edition.
Greening Asia – emerging principles for sustainable architecture. Singapore: BCI Asia.
Alan of Auroville Communication Centre. 2004: Auroville Architecture – Towards new forms for a new consciousness.

INTRODUCTION TO SUSTAINABILITY AND ENVIRONMENT			
Course Code	20ASH12	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	01:00:01	SEE Marks	60
Credits	02	Exam Hours	03

Objectives

The Course aims to provide incoming students an overview of the concept of sustainability in a holistic manner. Seen through the lens of lifestyle practices, day to day experiences, cultural influences, regional and local contexts, the idea of achieving a balance between economic, ecological and empathetic considerations of individuals is presented. The larger ideas and concepts of Lifecycle costs, impact on ecology around them, and the impact of these choices on users is brought to their attention.

Module-1

Introduction:

Understanding Sustainability as a holistic idea, and not limited to their industry background, Learning the importance of regional and local contexts both climatic and cultural.

Module-2

Examples from daily life such as food sourcing, selection of garment fabrics, use of construction materials, sourcing water and climatic responses and the idea of sustainability in choices related to it.

a. Economics as a driver for considerations in decision making in daily lives
b. Ecology as a driver for decision making in daily lives
c. Empathetic choices for the greater good in decision making in daily lives

Module-3

Natural selection process

The idea of "Natural Selection" through sustainable evolution of practices in a culture

Module-4

Sustainability in Small business

Being able to understand sustenance in a business decision making process through role play for small businesses such as pottery, handicrafts or service providers like a rice mill.

Module-5

Ecological protection

Understanding the cost of Ecological protection or conservation when it comes to issues like farming practices - such as clearing, crop rotation, seasonal response, conservation etc.

Course outcomes:

1. The students shall delve into climatic considerations regarding choices made by people in different places based on local context and apply it on the current situation.
2. Understanding the relationship between availability of resources and materials such as construction materials, agricultural produce and basic issues like access to water as drivers of development.
3. Understanding how cultures and cultural practices represent and showcase a sustainable response of communities and people over generations to their context - whether climatic or economic.
4. Studying and analyzing the impact of artificial forces (typically economic or external influence) on sustainable practices in a culture changing or evolving - eg: trade, embargoes, taxes and war.
5. Remembering and developing a summary of positive - negative attributes for economic drivers, ecological drivers and empathetic drivers in decision making and correlating them to short, medium and long term impact as an exercise in a given context and timeframe.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.

• There will be 2 full questions (with a maximum of four sub questions in one full question) from each module. • Each full question with sub questions will cover the contents under a module. • Students will have to answer 5 full questions, selecting one full question from each module
Text/ Reference Books
Carson Rachel. 1962: Silent Spring. Penguin
Brundtland, 1987, 2009: Our Common Future. Oxford Uni Press (OUP)
Principles of Sustainability by Simon Dresner , 2005, Earth Scan
Sustainable Architecture by Simon Guy and Steven Moore 2005, SPON Press

SUSTAINABILITY AND PARADOX OF DEVELOPMENT			
Course Code	20ASH13	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	02:01:00	SEE Marks	60
Credits	03	Exam Hours	03

Objectives

The Course aims to create an understanding of the dichotomies surrounding an act of "Development", and how there is impact - both positive and negative to any given initiative.

Module-1

Defining Development as an act that will change the current status quo of given place or practice

Module-2

Understanding that changing the way we do simple everyday things can change the world around us from an energy and material consumption, economic impact and lifestyle perspective.

Domestic practices and changes - an evolution with impact eg: washing machines increased water consumption, chemical use, freed up time for women to work.

Workplace changes such as going digital from paper, reduced cutting of trees but increased energy consumption, social disconnection and improved lifestyles and access to information.

Module-3

Industrialized Manufacturing and Virtual Economies - Comparing the two ends of doing business.

Spatial needs, physical resource use and direct impact pollution - Manufacturing Industry

Reduced space, higher returns, decoupled energy, space and pollution - Virtual Economy

Module-4

Industrialized Manufacturing and Virtual Economies (continued)

Proximal Impact vs. Remote Impact - Purchasing Green Credits to Data Centers & Solar Farms

Manufacturing as a job creator vs Manufacturing needing automation and reduced wastage

Easy Information access and remote working vs unhealthy lifestyle and high energy demand

Module-5

Understanding the problems of Rural Urban Migration, Growing Cities, and Economic Opportunities, and the need to balance the variables and disparities while ensuring sustenance of agriculture, manufacturing and Service industries while improving lifestyles across the spectrum in an effort to improve the ecological balance needed to sustain the development.

Course outcomes:

1. The students shall look at specific cases in the way small changes in lifestyle choices impact big changes in the environment, in terms of economic engagement and quality of life.
2. The idea that when we strive to be more efficient shows development and prosperity, but that comes at a cost, for the benefit enjoyed - being able to analyze and justify these is the primary task.
3. Being able to evaluate and achieve a balance between the good intent of development, and the havoc it can have on the other end of the spectrum whether locally or in a remote location.
4. Applying the smaller examples and knowledge in understanding the larger global issues to see how one positive initiative in one place can cause both a positive and a negative issue somewhere else. (eg: mining rare earth metals and the tech world)

Question paper pattern:
• The question paper will have ten questions. • Each full question is for 20 marks. • There will be 2 full questions (with a maximum of four sub questions in one full question) from each module. • Each full question with sub questions will cover the contents under a module. • Students will have to answer 5 full questions, selecting one full question from each module
Text/ Reference Books
Sustainable Urban Environments – An Ecosystem Approach by Ellen Bueren, and others, 2012, Springer
Sustainable Cities – Governing Urban Innovation by Simon Joss 2015 Macmillan
Sustainability in architecture and urban design by Carl Bovill, 2015, Routledge

ECOLOGY OF CITY & REGION			
Course Code	20ASH14	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	01:01:00	SEE Marks	60
Credits	02	Exam Hours	03

Objectives

The Course aims to focus on the relationship between an urban area and the regional context within which it is situated. It is to better understand sustainable issues related to people, the environment and the economic impact.

Module-1

Introduction:

Understanding that an urban area is a net consumer of resources and materials in the form of fuel, energy, water, construction material, food products etc., and is a net exporter of waste - in terms of waste water, sewage, garbage, air pollution etc

Module-2

Connecting the Importance of the Urban area to regional ecological and environmental riches such as minerals, climate, geographic advantage etc. to understand its existence within a point of reference.

Module-3

Understanding the absence of resources and other natural advantages pose a threat to the Urban development, that it tries to mitigate through economic activity and transactions to secure its sustenance

Module-4

Studying the impact of urban areas through case studies of various economically oriented urban developments from around the world such as - Agricultural Centers, Trading Hubs, Industrial Towns, Financial Centers, Technology Hubs etc. and their connection to, or disconnect from, their larger regions (state or district).

Module-5

Understanding the urban form in relation to response to climate and terrain, as well as regional connect and types of goods and services exchanged between the city and its regional context. Evidence of infrastructure as a connected existence to regional context vs. absence reflecting a major disconnect with regional context and dependency on external factors

Course outcomes:

1. Students will be able to understand Cities as a center of Human Economic Activity with a significant ecological impact but strong sociological benefits.
2. Being able to clearly recognize the idea of sustenance of an urban center depends as much on itself and its physical regional roots to potentially seeing the need for something more to secure its own future through trade and economic relations.
3. Being able to quantify impact, calculate the difference in energy and resource balance as an input / output scenario and identifying the Urban area's ecological debt in terms of economic need - such as how much energy, tones of food etc. that need to be supplied to sustain it and how much area of forest/farms/ rivers etc. are needed to keep it alive.
4. Applying the knowledge on smaller examples to see how one community can be planned/developed and investigate what impact or regional dependence it will need to have.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module

Text/ Reference Books
Planning for Climate Change ed by SiminDavoudi, Jenny Crawford, AbidMehmood, 2009 Earth Scan
An urban approach to climate sensitive desiqn by Rohinton emmanuael 2005 Span press
Ecoloqical Urbanism ed by Mohsen Mostafavi et al, 2016, Lars Mueller
The ecoedge- Urban design challenges in building sustainable cities ed by Esther Charles worth et al 2011 Routledge

COMMUNITY, NATURE AND LIVEABILITY			
Course Code	20ASH15	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	03:00:00	SEE Marks	60
Credits	03	Exam Hours	03

Objectives

The Course aims to use the scale of a community to study aspects of sustainability and how codependency is critical to achieving a balance between economic activity planned and the nature around it, while focusing on livability.

Module-1

Introduction:
Understanding Livability as a science and an appreciation of the needs and wants of the human population pegged on the idea that a certain quality life is expected by all.

Module-2

Looking at Livability as an evolving concept from the time of Hunter-gatherers to the tech-enabled world, with a potential to keep changing with the times.

Module-3

Realizing the importance of Communities and their social constructs and how this defines social strata, level of service and infrastructure development planning

Module-4

Understanding the economic drivers of a community, their importance and impact, recognizing disparities and the roles of the primary and supporting economic drivers.
Realizing Nature as the primary resource industry for urbanization initially, then leads to diversification due to improved lifestyle demands and choices that arise from economic growth and trade

Module-5

Eventually looking at Nature today as a displaced and curated entity in an Urban setting and how balancing its presence and its natural systems need to be achieved.

Course outcomes:

1. Students will be able to understand urbanization as a need for economic interdependence between communities arising out of an inability to sustain themselves in an isolated manner purely from the riches of the earth - agricultural, mineral and other natural wealth available.
2. Looking at prosperity as an enabler to improve lifestyle independently - disconnected from nature and community, but not necessarily livability.
3. Being able to recognize that Livability is a balanced outlook, and not a purely material understanding, and quality of life is about providing economic opportunity while staying connected to nature and community.
4. Understanding Social stratification and Social consciousness that leads to evolving outlooks on sustainability and the need for sustenance. The idea of existence in time - a lifestyle vs. timeless existence - a culture.
5. Evaluating communities and their social compositions and how this affects livability, access to infrastructure and the idea of a basic level of service expectation for communities to achieve sustainability.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module

Text/ Reference Books
Oliver Paul. 2006 Built to meet Needs. Elsevier.
Dyball Robert. 2012 Human Behavior and Sustainability
Livability and Sustainability of Urbanism An Interdisciplinary Study on History and Theory of Urban Settlement by Bagoes P Wiryomartono
Urban Social Sustainability Theory, Policy and Practice (Routledge Studies in Sustainability)

ECOLOGICAL DESIGN AND TECHNIQUE			
Course Code	20ASH16	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	60
Credits	02	Exam Hours	03

Objectives

The Course aims to introduce design of habitable environments that are in sync with nature and the ecological context of a development.

Module-1

Introduction:
Introduction to Climatic Design and the principles of designing with nature - Active and Passive Design.

Module-2

Revisiting natural ventilation systems, wind directions, wind scoops and wind energy
Understanding Solar Gain, mitigating heat gain, use of energy storage devices, generating solar energy
Solar shading and solutions to managing better access to light, light wells and use of reflected light

Module-3

Material selection and sourcing - local resources and palettes, availability by region.
Analysis of Design - Introduction to digital design analysis and software tools: Shading studies, Solar radiation studies, Lighting studies, Wind studies ,other simulations and studies

Module-4

Design for communities and larger planning areas, consideration for ecological design
lifestyle demands and choices that arise from economic growth and trade

Module-5

Preserving nature and its integrity, while pursuing development in a responsible manner
Optimizing Active interventions and increasing passive response to reduce impact.

Course outcomes:

- Students will be able to understand design responses to climatic contexts at a building level as well as community and larger planning levels.
- Students shall be able to differentiate between different ecological factors and developing a repertoire of design responses to them based on context, climate and local features, flora and fauna.
- Understand that larger Urban solutions may differ from smaller individual designs as they may respond much more to terrain, regional water and catchment solutions as well as infrastructure planning and connectivity.
- Students will be able to recognize and evaluate the use of natural resources and naturally occurring solutions to the advantage of the place while creating added impact in design

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module

Text/ Reference Books

Building to suit the climate – a handbook.Gerhard Hausladen, Petra Liedl , Birkhauser Architecture 2012

Emmanuel Rohinton. 2005: An Urban Approach to climate sensitive design – strategies for the tropics. Spon Press

Konya Allan and Vandenberg Maritz. 2011: Design primer for hot climates. UK: Archimedia Press

Hyde Richard. 2000: Climate responsive Design – study of buildings in moderate and hot humid climate. Spon Press.

DIALOGUE BASED AUGMENTED CASE STUDY			
Course Code	20ASH17	CIE Marks	100
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	-
Credits	02	Exam Hours	-

Objectives

The Course is designed as a forum for dialogue and critical thinking, with a focus on promoting engagement, action and change from the grassroots. The core aim is to develop arguments from multiple perspectives on specific case studies identified by students - to develop, modify and change the narrative to improve sustainability.

Outline

Dialogue is the gateway to change and having a healthy and constructive one is important to ensure clear presentation of ideas, and translation of ideas into reality.

Developing understanding of multiple perspectives on a megaproject identified as a case study will provide for arguments and critical thinking around all aspects of the project. The idea of an "augmented" case study is to go beyond the facts and look at the areas for improvement of sustainable practices

Teams of 3-4 students will develop and present detailed case studies of projects and present a sustainability analysis and evaluation system for the project. The Evaluation system will have inputs from the Value Propositions Management course to ensure that the ideas can be applied to existing and live projects as well.

Course outcomes:

- The students will be able to evaluate and identify areas of improvement creating opportunities to develop solutions through dialogue for each of the "Stakeholders" through role play.
- Students will be able to develop ability to argumentatively stand ground for key sustainable initiatives and show and prove the value propositions associated with choices being made.
- The role play aspect will ensure an understanding of the costs of such initiatives to or for other stakeholders and provide a platform for developing consensus and tradeoffs.

Text/ Reference Books

Live project case studies

Live project Reports

PROFESSIONAL ELECTIVE - I

A. URBAN DESIGN & INFRASTRUCTURE

Course Code	20ASH18A	CIE Marks	100
Teaching Hours/Week (L:P:SDA)	02:00:00	SEE Marks	-
Credits	02	Exam Hours	-

Objectives

This elective course aims to develop an understanding of design of public infrastructure and the associated urban design facilities for sustainability - how urban design promotes better use of and access to infrastructure.

Module-1

Introduction:

Urban design has always been seen as a magnet for and activator for public spaces and infrastructure. Development of a method for infrastructure-centered publicness in the design of urban public space by looking into the relationship between infrastructure and public space, changes in the concept of publicness in the age of globalization and personalization

Module-2

Use of Urban design in the context of public safety - view to the street, CCTV, security and activity define safe cities and clarify the role of urban planning and design and their elements on safe cities.

Importance of planning and design elements that reduce the opportunities for crime like: street planning, land use, building density, and role of management and good governance, in addition to urban design concepts.

Use of Urban design for promoting a healthy and active lifestyle in public spaces and parks.

Natural corridors and environments in urban and suburban areas, along with recreational, transportation and nature education opportunities for urban residents

Module-3

Urban Mobility and the development of a whole pedestrian ecosystem with dense neighborhoods.

intelligent networking of vehicles, mobility models, Better public transport systems, Networked traffic systems

Module-4

Connected cities and access to amenities and public conveniences, to shape cities so they connect the local populations with their environment. Collaborative effort that spans architecture, public space, sustainability, social equity, transportation and other aspects of city life

Module-5

Digital lifestyle, connectivity and continuity of virtual experience and attention span changes and the design responses needed to deal with a connected world. Smart technology as the base of futuristic design, Practical implications of technology in urbanization, New modes of transport and energy sources

Course outcomes:

1. Students will be able to recognize that urban design is needed to engage better with the public in giving them a full range of experiences to use public infrastructure
2. Students will be able to create solutions that will drive improved footfalls in retail districts and Transit Oriented Development areas that will improve use of public transport, and reduce last mile travel solutions.
3. Understanding that changing lifestyles will mean people's responses to external stimuli are changing, workplaces can be in the open, and public social engagement becomes important to urban dwellers to maintain real world social connections, while still being connected virtually.
4. Students will be to generate impactful solutions that reflect that - More time on hand improves productivity and social engagement in other activities for people.
5. Ensuring Security and Safety as areas of utmost importance - Passive and active solutions for monitoring and management.

Text/ Reference Books
The eco edge – Urgent design challenges in building sustainable cities by Esther Charlesworth, Rob Adams;2013Routledge
UDPFI Guidelines, Part I and Part II, 1996, Ministry of Urban development and Poverty Alleviation, Government of India.
Douglas Farr 'Sustainable Urbanism Urban Design With Nature' 2007
Carmona Mathew et al, 'Public Places Urban Spaces- The Dimensions of Urban Design',2003

PROFESSIONAL ELECTIVE - I

B. IMPACTS OF REAL ESTATE

Course Code	20ASH18B	CIE Marks	100
Teaching Hours/Week (L:P:SDA)	02:00:00	SEE Marks	-
Credits	02	Exam Hours	-

Objectives

This elective course aims to develop an understanding of the impact of real estate development. The idea of price sensitive development and associated impacts on sustainable development. Current challenges in terms of technology, response to problems at different scale of developments and price points in India.

Module-1

Why are all buildings the same in the residential space, and is there any real value proposition related to price points - or is it just the difference only in land values?

Module-2

Understanding the market and its response to changes in value of products - pure price to a value proposition. Are there such market differentiators? How many players in the market have a unique proposition that is significantly different?

Module-3

Is sustainable design a value proposition to the investor - as a social cause, a lifestyle mantra or is it seen in terms of a price point as being something additional?

Module-4

As a Real Estate Professional - the costs of being sustainable and the commitments towards it from a time and investment perspective

Module-5

Legal obligations towards sustainable design from code compliances, permits and infrastructure standpoint

Course outcomes:

1. Students will be able to understand market interest in sustainability and interest from the general population and the response to market demand from various developers in their marketing content.
2. Students will be able to understand the costs of being sustainable such as specialized certification, additional design and potential saving in energy and materials as a value proposition for investors and an upfront investment for the developer.
3. Students will be able to reflect on to the Value propositions which being key differentiators show that developers are trying to be unique, case studies of major developer projects showing trends towards more sustainable design.
4. Students will be able to analyse the compulsory legal provisions for real estate development such as safety systems, backup power, treatment and handling of waste and other aspects that have become the norm in India, but are still not handled at a project level in other parts of the world. Is this an area for improvement in city infrastructure or is it something to retain at a local level?

Text/ Reference Books

Chambers Robert. Can we know better – reflections for development.

Routledge Handbook of Sustainable

*** END OF I SEMESTER***

INTEGRATED DESIGN STUDIO - II			
Course Code	20ASH21	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	05:05:05*	SEE Marks	60
Credits	10	Exam Hours	Min. 30 mins/student

Objectives

The Course aims to allow the students to develop a design solution that is sustainable on a medium scale that looks at it as a team exercise of 2 persons. The project will aim to provide a solution based on value propositions using ecological architectural design principles. The building will then be evaluated against a standard rating system chosen by the team. Sufficient analysis of the project needs to be provided as proof of compliance for the targeted rating - such as product information, source of material, product composition, energy consumption, day lighting analysis, ventilation and cooling load assessment etc.

Modules/Outline

1. The project will be a small building that will have to be designed in keeping with Ecological architectural design principles. A statement of facts and design brief is to be prepared with goals for the project that define the key value propositions associated with typology, users and client as part of the brief and submitted (1 week)
2. Goals will be set to achieve the programmatic requirements and sustainability aspects for the project that have to be validated and approved by staff.
3. Project deliverables:
    a. Do a benchmarking case study for similar projects locally and from around the world - and submit (2 weeks)
    b. Develop a business plan, an environmental response plan and livability index on a measurable scale as a rating for the project (3 weeks)
    c. Create a design solution that will satisfy as much of the goals set as possible while addressing the key goals of the project. (5 weeks)
    d. Present the targets against the selected rating system for achieving a benchmark rating for the project (1 week)
    e. Provide supplementary evidence through software and calculations based analysis for the project as supplementary information to substantiate the claims. (2 weeks)
    f. The team shall provide a clear brochure of the project, present the submission for certification against a rating system and a sales pitch for the project designed to win over clients and investors. (2 weeks)

Course Outcomes

- Students will be able to formulate the project viable for achieving a rating against a specific Green Building Certification scale.
- The aim will be to test the design skills that balance passive and active design to tackle issues related to ecological design.
- Students will be able analyse and test the performance of the design which shall exhibit technological skills in software and an understanding of proof of concept and technical competence.

  The project brochures, investor and client pitches will showcase ability to convince the value propositions of the project in terms of economic benefits, environmental benefits and livability indices

Viva pattern:

- The exam shall be conducted as a panel jury exam which shall be minimum of 30mins/ student, where the student shall present the work in the form of sheets.
- Discussions, presentations, and studies will cover all the topics.
- The portfolio covering all the assignments shall be presented for term work

Text/ Reference Books

Sustainable Design Architecture, Planning, and Ecology by Orr, David W., Williams, Wiley; 1st edition

Greening Asia – emerging principles for sustainable architecture. Singapore: BCI Asia.

VALUE PROPOSITION MANAGEMENT & ANALYTICAL TECHNIQUES			
Course Code	20ASH22	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	03:00:00	SEE Marks	60
Credits	03	Exam Hours	03

Objectives

The Course aims to create the awareness of the need to show measurable impact for decision makers and to be able to discern value and impact of decisions in multiple ways to evaluate sustainable solutions.

Module-1

Introduction:

Understanding holistic value - as being more than monetary and linked to long term benefits that are less tangible.

The idea that intangibles can be evaluated through certain metrics as well and to arrive at such methods and principles for structuring that comparative analysis

Module-2

Introduction to evaluation through rubrics and analytical models for comparison and understanding of variables that can be used for presenting an argument.

Economics - direct capital costs, cost of financing, terms of borrowing, O&M costs, cash flow, returns on investment, impact on developer / financing institution / end user, life cycle costs

Ecology - CO_2 absorption, green area and typology, native species, air quality indices, carbon footprints, water quality, soil fertility, waste evaluation, biodiversity, embedded energy etc.

Livability - Improved health parameters, improvement in productivity, Happiness index, social engagement, level of fitness, education and engagement, utilization of time for leisure etc.

Module-3

Creating a balanced Evaluation chart for a project as test case to conduct evaluations against decisions

Understanding that each component can change the whole balance across the matrix.

Module-4

Review and understand standardized scoring and evaluation systems of various green building rating systems across the world such as GRIHA, LEED, WELL, GREENMARK, LIVEABLE CITIES and others.

Management Decision making and how its driven by objective and clear facts to showcase value.

Module-5

Management controls and systems for monitoring and evaluation for projects and progress to showcase to investors, customers etc. and to ensure tracking and alignment with core values.

Course outcomes:

- Student will be able to evaluate and develop constructive metrics for objective decision making.
- Student will be able to create and design evaluation systems with a holistic understanding of impact.
- Understanding the pros/cons of various standardized evaluation systems.
- Knowing value additions with tangible benefits to end user and client is more important for sustainability than simplistic standardized certification.
- Looking at creating custom solutions for clients/end users to present their case strongly for sustainability and defend justifiable decision making using objective metrics.
- Students will be able to make Management decision, justification of stand and progress to investors and customers, and being able to prove and ensure being on track for goals set for the project.

Question paper pattern:
• The question paper will have ten questions. • Each full question is for 20 marks. • There will be 2 full questions (with a maximum of four sub questions in one full question) from each module. • Each full question with sub questions will cover the contents under a module. • Students will have to answer 5 full questions, selecting one full question from each module
Text/ Reference Books
GRIHA; Griha Manual, Vol 1 to 5,TERI Publication
IGBC Manuals, CII Publication
LEED Manuals
ECBC Manual
Mehta M ; Commentary on water and air pollution with environmental protection law

ECOLOGICAL ARCHITECTURE			
Course Code	20ASH23	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	03:00:00	SEE Marks	60
Credits	03	Exam Hours	03

Objectives

The Course is designed to showcase ecologically friendly and responsive architectural designs, taking forward from the techniques learnt in the previous semester.

Module-1

Introduction:
Understanding Ecological Architecture and Application of techniques of Ecological Architecture in sample sites and specific locations

Module-2

Analysis of performance based metrics for comfort, light, humidity, temperature and air movement.
Utilization of value proposition techniques to understand choices being made in terms of capital investment in passive solutions and aesthetic choices in comparison to the cost of maintaining comfort through use of active systems, through testing specific comparable solutions to understand potential extremes

Module-3

Group Design of a simple project such as a small 2-bed residence in the 6 different climatic zones of India to see the changes in design response and language of architecture through use of passive solutions.

Module-4

Group Design of a simple 3 story state of the art office building in the 6 different climatic zones of India, with a specific aim to understand active control systems and smart devices such as kinetic facades, rotating solar panels and active humidification systems and air conditioning.

Module-5

Group Design of a hybrid solution for maximum impact in development of a small 10 room guest house and club facility in a complex climatic condition that will need both active and passive systems to become completely off-grid.

Course outcomes:

- Students will be able to understand the value of climatic response through design.
- Students will be able to apply technical choices in an informed manner through object evaluation.
- Being able to respond in a completely passive manner to any given problem, while also ensuring that active design solutions may be needed to compensate in some areas.
- Taking simple techniques learnt in the first semester and learning their application in a project, to better understand where they may act in tandem to improve, in some cases and work against each other, in some cases, to achieve sustainable outcomes.
- To foster the ability in formulating design briefs for projects to respond to different climates and locations using key parameters to define comfort, financial impact and environmental response.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module

Text/ Reference Books
Design Ecologies- essays on nature of design by Lisa and Beth, 2010, Princeton
Ecological Architecture- World Classics pub by Phoenix Pub ltd, 2012
Building Ecology by Peter Graham 2003 Blackwell
The ecology of Architecture by Laura Zeiher 1996 Whitney Library

ACTIVISM & INNOVATION IN ECOLOGICAL PERSPECTIVE			
Course Code	20ASH24	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	03:00:00	SEE Marks	60
Credits	03	Exam Hours	03

Objectives

The Course is designed to develop an understanding on how sustainable activism and innovation go hand in hand with the ability to use them to drive ecologically sustainable responses in simple things from operations of a business to design of cities and infrastructure projects - when a new perspective comes into play.

Module-1

Understanding Activism and the movement to drive awareness and bring to light problems of people and the environment

Module-2

Looking at Innovation as a change in mode of engagement and incorporating creative approaches to project structuring, setup of management processes and evaluation systems to ensure optimal sustainable responses (rather than just technological innovation).

Module-3

Identifying opportunities within projects to create and specific areas of Impact that may be aligned with UNSDGs, or other key program parameters of National and State organizations to see if they can be addressed with independent models.

Module-4

Looking at Social and Ecological subset of Infrastructure investment projects as potential opportunities in their own right - eg: development of a self-sustaining rehabilitation projects for native population in the case of building dams, highways etc., development of protected eco-sensitive areas with self-sustaining capabilities as part of larger regional and urban plans with opportunity for monetization, and promotion of research and development.

Module-5

Understanding sustainable urban farming and greening of underutilized areas of cities with sustainable business models and revenue streams.

Course outcomes:

- Students will be able to understand that social and ecological responses are not a charitable effort alone, but that significant opportunities exist to create business models around it that will allow for sustainable management and long-term security for these commitments.
- Students will be able to understand that social welfare is not limited to offering basic shelter for rehabilitated people, but ensuring a new way of life, with economic opportunities and creation of a full sustainable ecosystem around them including training, hand-holding and potential go-to market strategies for new economic activities.
- To ensure that the concept of activism is not left at awareness creation, but extended to developing sustainable solutions for action and improvement on the ground in a time bound manner to reduce impact on the lives of the people and the environment..

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module

Text/ Reference Books

Watts Alan.1970, 1998: Does it Matter – essays on man's relation to materiality. California: New World Library

This changes everything by Naomi Klein 2014 Penguin

GREEN BUILDINGS CONCEPT RATING SYSTEM			
Course Code	20ASH25	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	03:00:00	SEE Marks	60
Credits	03	Exam Hours	03

Objectives

The Course is designed to create awareness and understanding of Green Building Rating systems, classification and understanding of why standardized ratings are needed for industries and corporate to prove their commitment to sustainability .

Module-1

Introduction:
In depth study of the Green Rating Systems from India and across the world such as GRIHA, LEED INDIA, LEED USGBC, WELL, GREENMARK and others

Module-2

Understanding the need for third party certification and audits in such scenarios and why this becomes critical for many businesses to prove corporate commitment to investors, shareholders etc

Module-3

Implication of rated products, services and facilities to the larger industry.
Issues faced by small businesses and handicraft industries in being able to get certified or registered.

Module-4

Choosing between Active Systems or Passive solutions and evaluating their ability to score on a rating system for many test cases - is this choice critical to scoring to better or do they perform equally.

Module-5

Going beyond the limits of a rating system to ensure client's sustainability interests.

Course outcomes:

- Students will be able to understand various rating systems and their applications and working mechanisms, evaluation criteria and rubrics.
- Students will be able to analyse and evaluate the corporate commitment vs. small industry needs and understanding how to incorporate and preserve traditional methods and solutions and engage the handicraft industry and artisans effectively while ensuring rating requirements are met.
- Students will be able to understand that sometimes Rating systems cannot address all needs, and that a Client's needs outweigh the systems available if they are truly committed to making a difference - using Value Proposition Management and Analytical techniques to create a trackable evaluation and monitoring system for the client that can be audited as alternative commitments for unique solutions to showcase for innovative points on a rating system or to investors and stakeholders to prove compliance and capability.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module

Text/ Reference Books

GRIHA; Griha Manual, Vol 1 to 5,TERI Publication

IGBC Manuals, CII Publication

LEED Manuals

URBANISATION AND SUSTAINABILITY			
Course Code	20ASH26	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	02:00:00	SEE Marks	60
Credits	02	Exam Hours	03

Objectives

The Course is designed to understand the huge challenge that faces South, South East Asia and Central Africa as Urbanization pushes about 2 billion people out of a rural economy into Urban economies .

Module-1

Introduction:
Urbanization through migration for jobs and opportunities - a study of major metropolitan cities in India and the world.

Module-2

Urbanization through growth of rural centers and impact of a changing economy and affordability in regional centers with growing population

Module-3

The need to manage the growth of larger metropolitan areas and limit their growth and increase densities to ensure better balance with their regional ecological impact.
The need to allow for growth of new economies by seeding industries away from major urban centers to push growth into rural centers.

Module-4

With growing demand for food and produce, enhancing the rural economy with mechanization, food processing and improved logistics to create higher levels of economic opportunity, while improving productivity.

Module-5

With growing flexibility of tech jobs and need for more construction and infrastructure in lower tier Urban areas and Rural areas, the reverse movement of population needs to be seeded for distributed growth.

Course outcomes:

- Students will be able to appreciate and understand that Urbanization is a challenge for the ecological and environmental footprint of the region surrounding major urban centers.
- Students will be able to reflect to the idea of urbanization also means that smaller cities and rural areas can transform through investment into new Urban centers and that they can be more harmonious with their surroundings.
- Developing an understanding that sustenance of urban centers depends on having a working population with jobs being created to ensure that people are economically active, while being able to enjoy better livability.
- Students will be able to conceive the need to balance the regional development with the urban hubs so that the overall ecological impact of such intensive development can be moderated.

The change in scale from the smaller projects to the massive challenges of urbanization that this course will open their eyes to will surely make an impact on the level and type of change these students will aspire to.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module

Text/ Reference Books

Saskia Sassen. 2001: The global City. Princeton Uni press

Sustainable Infrastructure by Charles Ainger 2014 ICE London

Sustainable Residential Development: Planning and Design for Green Neighborhoods, Avi Friedman. McGraw-Hill, New York, 2007

RESEARCH METHODOLOGY & IPR			
Course Code	20ASH27	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	60
Credits	02	Exam Hour	03

Module-1

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration

Module-2

Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.

Module-3

Design of Sampling: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.
Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement Tools, Scaling, Scale Classification Bases, Scaling Techniques, Multidimensional Scaling, Deciding the Scale.
Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method

Module-4

Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis.
Chi-square Test: Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi Square Tests.

Module-5

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

Intellectual Property:The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999,The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act1999, Copyright Act,1957,The Protection of Plant Varieties and Farmers‟ Rights Act, 2001, Trade Secrets, Utility Models, IPR and Biodiversity, The Convention on Biological Diversity (CBD) 1992, Competing Rationales for Protection of IPRs, Leading International Instruments Concerning IPR, World Intellectual Property Organization (WIPO),WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules, Patents, Marks, Industrial Designs, Trade Names, Indications of Source, Unfair Competition, Patent Cooperation Treaty (PCT), Advantages of PCT Filing, Berne Convention for the Protection of Literary

and Artistic Works, Basic Principles, Duration of Protection, Trade related Aspects of Intellectual property rights (TRIPS) agreement, covered under TRIPS agreement, features of the agreement, protection of Intellectual property under TRIPS. Copyright and related rights, trademarks, Geographical indications, Industrial Designs, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents, Other Use without Authorization of the Right Holder, Protection of Undisclosed Information, Enforcement of Intellectual Property Rights, UNSECO.
Course outcomes:
At the end of the course the student will be able to: develop the research skills in a systematic manner which will impart the ability to select appropriate research methodology, experimental design, follow professional ethics and academic integrity, and develop written presentation skills, Discuss various forms of the intellectual property, its relevance and business impact in the changing global business environment and leading International Instruments concerning IPR
Text/ Reference Books
Research Methodology: Methods and Techniques, C.R. Kothari, GauravGarg,New Age International,4th Edition, 2018.
Research Methodology a step-by-step guide for beginners. (For the topic Reviewing the literature under module 2), RanjitKumar, SAGE Publications,3rd Edition, 2011.
Study Material (For the topic Intellectual Property under module 5), Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013.
Research Methods: the concise knowledge base, Trochim, Atomic Dog Publishing, 2005.
Conducting Research Literature Reviews: From the Internet to Paper, Fink A, Sage Publications, 2009

PROFESSIONAL ELECTIVE - II

A. TRADITIONAL KNOWLEDGE SYSTEM

Course Code	20ASH28A	CIE Marks	100
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	-
Credits	02	Exam Hours	-

Objectives

The Course is designed as an elective with the focus on understanding the idea of sustenance as being maintainable over a long time. Traditional Knowledge systems allow for us to understand lifestyle and cultural choices that have become ingrained in people from simple dietary choices to planning principles based on resource availability to infrastructure management.

Module-1

Study of Traditional buildings, case studies and analysis based on climate, cultural practices and beliefs and an understanding of passive and active systems used as climatic responses that have sustained over time

Module-2

Study of Traditional Planning principles and zoning laws driven by industry and type of work.

Module-3

Understanding the impact of available resources and infrastructure in the development of sustained cultural and traditional practices such as building construction, social space creation and management and infrastructure development, ownership and operations.

Module-4

Ecologically sensitive responses of various traditional knowledge systems to their surrounding context, climate and other natural and environmental phenomena.

Module-5

Traditional stimulants for trade, economic activity and other requirements that drove local economies.
Traditional methods and practices related to water harvesting, management and curation of and maintenance of public spaces, gardens and amenities

Course outcomes:

- Students will be able to appreciate and understand the sustained practices over time, in keeping with local availability, response to climate and other basic aspects that drove the traditional knowledge systems to be enshrined as a baseline standard of practice for the context and location.
- Students will be able to understand why some traditional practices were timeless and sustained over a long period and an examination into the external influences that changed, attempted to influence or caused evolution of certain practices over time.
- Students will be able to determine why change and sustenance go hand in hand, and how external influences tend to evolve and change, and their acceptance or adoption rates vary depending on efficacy, economic access and perceived improvement to livability indices.
  Gaining an understanding that the original founding principles of a traditional knowledge system may continue to be valid, and still may continue to evolve - some aspects of how it is interpreted or achieved given changesin technology, financial affordability etc.

Text/ Reference Books

Traditional Ecological Knowledge: Learning from Indigenous Practices for Environmental Sustainability, Melissa K. Nelson, Daniel Shilling

Sustaining Traditional Agricultural Practices for Food Security, V K Dubey , ShailendraNathGhosh

PROFESSIONAL ELECTIVE - II

B. DESIGNING WITH NATURE

Course Code	20ASH28B	CIE Marks	100
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	-
Credits	02	Exam Hours	-

Objectives

The Course is designed as an elective with the foundational thought anchored in being able to design with nature and what it has to offer. The idea that we can use nature, climate and natural systems and materials to improve our livability and comfort, while being economically responsible is critical to being sustainable.

Module-1

Understanding Nature and its components - Flora, Fauna, Climate, Land, Water, Materials and Minerals etc.

Module-2

Use of natural systems and processes in design - evaporative cooling, shading using landscapes, drought resistant plants, native species, soil properties for water storage and harvesting, stone and other natural materials for use in processes like filtration, heat absorption and other aspects, use of natural symbiotic species for pest control etc.

Module-3

Identifying natural materials for construction in difficult locations and environments - use of easily available and harvestable materials with short growth cycles such as bamboo, use of naturally produced wastes as a result of other mineral and material manufacturing such as fly ash, slag and other products.

Module-4

Designing with physical constraints posed by nature - such as position and size of natural features - trees, water bodies, rocks, cliffs, rivers and other natural features.

Module-5

Design of and Regulatory frameworks for allowing use of temporary and permanent construction based on location, natural features and impact to the environment. Understanding of design and development of standalone built modular systems that may be positioned completely off-grid.
Designing in protected areas such as CRZ zones with limited development rights, Forest edge areas and low impact zones.

Course outcomes:

- Students will be able to gain understanding of natural features, and components of nature and learning to use them effectively for sustenance of the development as an intrinsic part of the program and plan.
- Students will be able to use and create natural systems and processes effectively to gain from them passively and at relatively low cost.
- Students will be using materials and wastes that are from nature that can be given back, or reused more effectively without being discarded as wastes or pollutants.
  The ability to de-link a development and build off-grid facilities in nature that respect it and become a part of it, while using it to gain required energy and resources to sustain itself

Text/ Reference Books

Olsen Richard. 2012: Handmade Houses – a century of earth friendly houses. Rizzoli.Asquith Lindsay and Velinga Marcel. 2006: Vernacular Architecture in the 21st Century. Taylor and Francis (T&F)

Hassan Fathy - Architecture for the Poor: An Experiment in Rural Egypt

Rudofsky Bernard. 1964, 1987: Architecture without architects. Uni of New Mexico Press

*** END OF II SEMESTER***

SUSTAINABLE MANAGEMENT & DESIGN STUDIO (SMART)			
Course Code	20ASH31	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	05:05:05*	SEE Marks	60
Credits	10	Exam Hours	Min. 30 mins/student

Objectives

The Course aims to allow the students to develop a design solution that is sustainable on a large scale, that looks at it as an individual exercise. The project will aim to provide a solution based on smart management design propositions using ecological architectural design principles.

Modules/Outline

1. The project will be conceived as a large development to be undertaken for which an Environmental and Social Sustainability Plan as well as Business Management Plan needs to be developed with commitments for preparing EIA and Environmental Clearance related submissions (1 week)
2. An understanding of the impact of the project, its stakeholders and impacted parties need to be assessed, their demands for commitments from an environmental, social and business sustenance standpoint needs to be addressed and brief drawn up as problem statements (2 weeks).
3. Project deliverables:
    a. Social Commitments to stakeholders - such as existing community (rehabilitation and resettlement (R&R) and community future), users of proposed development (their demands for best in class facilities, and ease of doing business and managing and reporting their commitments on environmental compliance etc.), company employees and staff involved in the project (safety, security, amenities during the construction phase) etc.(3 weeks)
    b. Environmental Commitment to Stakeholders - Development of assets for use by people under R&R, facilities and assets for ease of doing business and ensuring compliance to environmental commitments by new users (Centralized CETP, Pollution monitoring, certified services, Zero Liquid discharge, Green belt development and maintenance, water and flood management etc. (3 weeks)
    c. Business case for developer and ability to maximize revenues and values through commitments made for social and environmental reasons. Alternate revenue streams from Environmental assets, potential to use additional economic assets created in support of the R&R community as revenue streams for the development / business case (3 weeks)
    d. Integrate the whole and create a structured program for creating a responsible mega-project and present the case to a panel providing the case for all three aspects - to get a business approval from “the Board” to go ahead with the project, to get “environmental clearance” through commitments made, and “political buy in” to make sure that locals affected will be provided a new and promising lifestyle ahead (3 weeks)
    e. Final Presentations: (1 week in three sessions)
        i. Presentation 1 - to a viva committee and peers that will act as the “Company Board”; changes to be incorporated before going to presentation 2.
        ii. Presentation 2 - to a viva committee and peers that will act as the “Environmental agency”; changes to be incorporated before going to presentation 3.
    f. Presentation 3 - to a viva committee and peers that will act as local political and community leaders wanting to ensure that the local population is addressed effectively

Course Outcomes

- Students will be able to create a strong case for a mega project and seek approvals form a business success perspective as a developer.
- Students will be able to build a strong case for environmental commitments to ensure ease of doing business, compliance and certification for these aspects to ensure management and process control throughout the life of the project and an implementation plan that will benefit all stakeholders.

• Students will be able to create a strong case to the local community in a way that protects their interest and shows them a secure and potentially improved lifestyle opportunity with strong commitments and sustainability of a new life - rather than just a onetime payout.
Viva pattern:
• The exam shall be conducted as a panel jury exam which shall be minimum of 30mins/ student, where the student shall present the work in the form of sheets. • Discussions, presentations, and studies will cover all the topics. • The portfolio covering all the assignments shall be presented for term work.
Reference Book
Design and management of sustainable built environment by Runming Yao 2013 Springer-Verlag

SUSTAINABLE MANAGE SYSTEM AND CONTROL			
Course Code	20ASH32	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	60
Credits	02	Exam Hours	03

Objectives

The Course aims to bring to attention the continuity of the idea of sustenance - one that requires constant maintenance and upkeep. Operations, Management and Maintenance are critical to remain sustainable. To achieve this all levels of processes, governance and control mechanisms need to be in place.

Module-1

Understanding that Sustainability is by definition a long term process and not a one-time effort means that a lot of continued energy and effort needs to be spent on ensuring its success.

Module-2

Management as concept - from organizational goals and values - to operations management and reporting - from awareness creation and education - to process based change management - The aim is to understand project based and organization based systems for management.

Module-3

Understanding the use of data and performance metrics in defining baseline performance and monitoring change and evolution of systems, processes etc. to achieve set goals such as energy conservation, water discharge etc.

Module-4

Optimization and the role of managing activities within a business or project based on time, effort and sequencing to ensure sustainability in terms of energy consumption, wait times and efficiency of operations. These may be quantified using measures of Carbon footprint, time spent and energy utilized or resources utilized.

Module-5

Understanding types of Control systems and the use of IBMS, Smart Sensors and Command and Control Centers for efficiently monitoring, and using feedback systems to manage and control utilities, services and production processes. Smart Infrastructure - use of sensors for leak detection, motion detection, heat loss, light emittance, conductivity and other factors to identify issues with performance and detection of technical faults, pilferage and other issues.

Course outcomes:

- Students will be able to understand that Managing Sustainability to last through the life of a project or process is key to its success.
- Students will be able understand and will be able to develop methodologies and processes that manage the outcomes is key to achieving sustainability - as it is based on long term impact and not just short term solutions
- Developing an understanding and ability to understand that Management and control is needed to ensure that sustainable practices can achieve guaranteed outcomes. If not an intended solution can cause more harm if left unused or not managed and maintained overtime - eg: Rain water harvesting pits if not maintained can lead to stagnation and flooding.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module

Text/ Reference Books
Design and management of sustainable built environment by Runming Yao 2013 Springer, Verlag
Principles of management by HarildKroontz 2009 Iata McGraw Hill

ADMINISTRATION, GOVERNANCE AND IMPLEMENTATION IN SUSTAINABILITY			
Course Code	20ASH33	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	60
Credits	02	Exam Hours	03

Objectives

The Course aims to create awareness about Climate change impacts that are promised at a global level and how efforts are being made to ensure that those commitments are honored and implemented. The process of Administration and Governance is key to ensuring implementation of intent. The process is difficult but necessary.

Module-1

Global Climate Change commitments such as the Paris Accord, trade agreements, WHO commitments regarding health and safety, ILO commits for workers, FAO commitments regarding food production and impact in many other areas such as Emission control, hunting and fishing laws etc.

Module-2

Governance is a key to understanding policies related to industry and development - a study of Environmental regulations ata National Level - Ministry of Environment and Forests / Ministry of Commerce and Industry, Ministry of Housing and Urban Affairs etc .

Module-3

Governance and implementation of Sustainable Green Design practices - Green mark Singapore as a case study for continuous monitoring vs. LEED as a case of one time implementation and changing trends.
Implementation of policies and timelines as commitments - Study of GRIHA as a standard of practice to be adopted by government buildings and enforcement of the same.

Module-4

Environmental Impact Assessment and Environmental Clearances at state and Central level for monitoring commitment for industries and development works - current practices, and international best practices - one time commitment over long term monitoring and enforcement. Indian practices, European practices.

Module-5

Public awareness and transparency to ensure ease of enforcement through societal pressure, as opposed to drastic clean up measures and shut down as solutions for long term success. Use of the idea of Community Buy-in and Stakeholder Engagement as opposed to open activism.

Course outcomes:

- Students will be able to understand that Managing Sustainability to last through the life of a project or process is key to its success
- Understanding and being able to develop methodologies and processes that manage the outcomes is key to achieving sustainability - as it is based on long term impact and not just short term solutions
- Students will be able to understand that larger impact from a governance perspective - whether for an organization, a city, state or country, these measures will define the path to success.
- Having Goals and targets be measurable, enforcing policies and regulations with strict adherence measures and mandates will be key.

Question paper pattern:

- The question paper will have ten questions.

• Each full question is for 20 marks. • There will be 2 full questions (with a maximum of four sub questions in one full question) from each module. • Each full question with sub questions will cover the contents under a module. • Students will have to answer 5 full questions, selecting one full question from each module
Text/ Reference Books
GRIHA; Griha Manual, Vol 1 to 5,TERI Publication
Petts Judith; Handbook on Environmental Impact Assessment
Y.Abbi&S.Jain; Handbook on energy audit and environmental management
Larry Canter, Environmental Impact Assessment
Recommended EIA Reports from MoEF website

LIFE CYCLE ANALYSIS (PROJECT & PRODUCT)			
Course Code	20ASH34	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	02:01:01	SEE Marks	60
Credits	03	Exam Hours	03

Objectives

The Course aims to create a clear understanding of the actual impact on the environment that we have in everything that we do. It is measured by understanding all the inputs that go into making a product then tracked through its lifecycle and ultimately the waste it generates and what can be done with it.

Module-1

Introduction to Life cycle cost analysis
a biological metaphor and how it applies to products and projects

Module-2

Lifecycle of a Product

a. Into a product during manufacture - time, energy and material and how this is measured,
b. Logistics and Sales - the logistics, go to market, sale and handover to user,
c. The Actual Use Life Cycle - From purchase till discarded or breakdown - the use of material, energy and time by the product and how it's broken down .
d. Post Use - When material is disassembled, can it be recycled, sent to landfill, repaired and reused - what are the options and how it is factored.

Module-3

Lifecycle of Projects

a. Conception of a project and its - time, cost and material inputs
b. Pre-implementation inputs - Consultancy, Permits, Approvals, Surveys and testing and other processes as part of feasibility, design and engineering.
c. Implementation phase - Focus more on the materials, their individual make up and lifecycle cost, environmental impact and social benefit - as individual components (such as bricks, concrete, steel etc)
d. Impact Evaluation - Is the sum of the parts larger than the whole - As a finished project - what are the Time, Energy and Material needs it has during operations and its impact on the larger world around it. Does it only add to the impact, or does it give back as well?
e. Post-Use Scenario - Can the project be upgraded and used, can it be replaced fully, what happens to waste generated and other components?

Module-4

Understanding Life Cycle Costs Analysis, and Life Cycle Impact Analysis.

Module-5

UNSDGs and their acceptable measures

Course outcomes:

- Students will be able to describe what lifecycle inputs constitute, and understanding that the comparison of the impact during production, lifetime of product use and final disposal are key to determining its value proposition.
- Students will be able to analyse and evaluate as a project, how is it different being just a product, and how impact is now measured both in simple terms, as well in larger social and ecological terms with UNSDGs coming into play.

Question paper pattern:
• The question paper will have ten questions. • Each full question is for 20 marks. • There will be 2 full questions (with a maximum of four sub questions in one full question) from each module. • Each full question with sub questions will cover the contents under a module. • Students will have to answer 5 full questions, selecting one full question from each module
Text/ Reference Books
Carbon Foot Print by Ramesh Menon 2014 TERI
Sustainability Assessment Ed. By Alan Bond et al 2013 Routledge
Life Cycle Assessment by Kathrina Simonen 2014 Routledge
Y.Abbi & S.Jain; Handbook on energy audit and environmental management
Talwar; Environmental management.

ENVIRONMENTAL ECONOMICS			
Course Code	20ASH35	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	60
Credits	02	Exam Hours	03

Objectives

The Course is structured to create an understanding of the value of the environment in terms of economic impact and potential. With a marked shift that underlines the traditional approach of looking at Economic impact of environmental policies to recognizing economic potential of the environment.

Module-1

Environmental Economics - The traditional Approach - Environmental policies and their impact on doing business.

a. Addressing pollution and its impact on construction, automobiles and transportation
b. Control in Mining and resource exploitation and impact on material costs, availability and access
c. Sustainability as a corporate initiative and the impact on cost of construction

Module-2

New Age Environmental Considerations and the study of the potential for economic advantages without exploitation of environmental resources.

a. Sustainability driven by sustenance industries and their value growth, potential and scalability (handmade products, natural low value materials, waste material re-use etc.)
b. Local economy at grass roots level and potential to scale, innovate and create increased value opportunities
c. New industries for use, repurposing and processing of underutilized resources, unused waste and other types of opportunities - eg: fly-ash bricks, carbon tiles, m-sand and others.

Module-3

Understanding and Developing an economic structure for low-impact living in a sustainable ecosystem.

Module-4

Creating economic frameworks with sustainable multivariate income streams for relocated and rehabilitated communities, with opportunities for jobs, growth and development.

Module-5

Environmentally sustainable and renewable practices in farming, forestry and post-disaster curation efforts

Course outcomes:

- Students will be able to understand that the Environment is a resource with potential for recurring economic returns in a sustainable manner.
- Students will be able to understand the ability to monetize environmental assets by valuing them as significant and needing protection, while reducing intrusive development and promoting low-impact development in harmony with nature.
- Students will be able to evaluate economic impact of environmental measures that reduce economic performance in traditional models, but also will be able to develop alternate revenue sources to reward the commitment to environmental protection and promote them with incentives.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.

• There will be 2 full questions (with a maximum of four sub questions in one full question) from each module. • Each full question with sub questions will cover the contents under a module. • Students will have to answer 5 full questions, selecting one full question from each module
Text/ Reference Books
Hanley N,Shogren JF and White B, Environmental Economics in Theory and Practice, Macmillan India Ltd.,1997
Roger Perman, Yue Ma and James Mc Gilvery, Natural Resource and Environmental Economics, Addison Wesley Longman Ltd.,1997
Bromley D.W.Hand book of Environmental Economics, Blackwell 1995
Sankar U (ed) Environmental Economics, OUP, 2000

BUSINESS SUSTAINABILITY & RESILIENCE			
Course Code	20ASH36	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	02:01:01	SEE Marks	60
Credits	03	Exam Hours	03

Objectives

The Course is developed to focus on the impact of environmental and social sustainability on Business Sustenance and Resilience.

Module-1

Understanding that commitment towards the environment and social responsibility will add to the cost of doing business. Being able to plan for and mitigate adverse impact on business sustenance is critical for long term success.

Module-2

Costs of Environmental commitments and the factors that affect it - Infrastructure, Logistics, material sourcing, energy use and location of business, building performance etc.

Costs / Benefits of Social Responsibility to various stakeholders - employees, neighborhood and community, clients and product users and suppliers of raw materials.

Module-3

Doing business in a sustainable manner - Environmental Initiatives - ensuring continuity, development of alternative sources, ensuring reliability, replenishment of sources and renewing the land for alternate beneficial uses etc.

Costs of doing business in a sustainable manner - Social Initiatives - being able to ensure livelihoods and meet economic aspirations, promotion of continued engagement, ensuring economic security, education and training, up skilling, rights to individual freedoms, benefits such as insurance, safety, security and equality etc.

Module-4

Businesses and their collective conscious responsibility - ethical businesses, responsible businesses, eco-friendly businesses, Corporate Social Responsibility (as continued legacies instead of one off attempts for sustenance of initiatives) and other forms of corporate commitments and types that are used today to define sustainable business practices.

Module-5

Business Sustainability as an economic endeavor alone, and the need for social and environmental commitments today in that context to understand why even traditional businesses rely on these aspects for maximum longevity and sustenance in their key markets.

Trading in Green Bonds, Financing through Green Bonds, Carbon Credit trading and other monetization methods for Business Resilience against commitments to sustainability.

Course outcomes:

- Students will be able to gain an understanding of what costs are associated with sustainable commitments, why these have to be long term and ingrained into a business culture and identity, as much as being part of normal best practices.
- Social Welfare and Business performance as drivers in sustainability
- Students will be able to reflect on environmental commitments and how it can offset carbon, and provide alternative green financing opportunities for businesses at lower interest rates, carbon credits for trading and other benefits.
- Students will be able to understand that rated and certified sustainability commitments can also benefit from lower interest, better bond valuation and increased ability to do carbon trading to raise financing for businesses.

Question paper pattern:
• The question paper will have ten questions. • Each full question is for 20 marks. • There will be 2 full questions (with a maximum of four sub questions in one full question) from each module. • Each full question with sub questions will cover the contents under a module. • Students will have to answer 5 full questions, selecting one full question from each module
Text/ Reference Books
Corporate Sustainability in the 21st Century: Increasing the Resilience of Social-Ecological
The Nature of Business: Redesign for Resilience

PROFESSIONAL ELECTIVE - III

A. SUSTAINABLE DEVELOPMENT LAWS IN INDIA

Course Code	20ASH37A	CIE Marks	100
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	-
Credits	02	Exam Hours	-

Objectives

The Course is developed to focus on regulatory mechanisms and commitments to environmental protection and regulation, while ensuring that long terms goals of country can be achieved - a perspective on why regulation is needed in the larger scheme of things, while we also look at how and what day to day impacts are there on businesses, development and implementation of projects.

Module/Outline

1. International Treaties and Commitments for Sustainable Environments for long term goals –
    a. Aarhus convention
    b. Basel Convection
    c. Convention on the protection and use of Transboundary watercourse and International lakes
    d. Framework convention on climate change
    e. International treaty on Plant genetic resources for food and agriculture
    f. Kyoto Protocol
    g. United nations Framework convention on climate change
    h. Vienna convention for the protection of the Ozone layer
    i. Nagoya protocol on access and benefit sharing 2010 Japan
    j. United Nations Convention to Combat desertification
2. Indian Laws and Regulations - Centrally Imposed
    a. Environmental protection act 1986
    b. Central Pollution Control Board - Standards and Regulations
    c. State Pollution Control Board - Standards and Regulations
    d. Ministry of Environment and Forests - Guidelines for different environmental Protection areas
    e. Bureau of Energy Efficiency (BEE) Energy Conservation Building Codes (ECBC)
    f. Mandates for PWD / other governmental agencies for GRIHA rated development
    g. Guidelines for tax relief / or other benefits - Green Energy, Green Mobility, Zero Liquid Discharge, soil protection, etc.
3. Looking at regulatory frameworks for Business Commitments as costs vs. potential opportunities for alternate revenue streams.
4. Looking at Environmental protection requirements and seeding new business opportunities.
5. Ecological Commitment vs. Better lifestyle and environment for all stakeholders - eg: healthier employees leading to better productivity.

Course outcomes:

- Students will be able to understand various regulatory frameworks, and the abilities of a governmental agency to implement change towards tangible goals
- Compliance and convenience to industry in achieving these commitments. Ease of Doing Business, Improved Lifestyles and living standards and secondary benefits for businesses as well as the community.
- Students will be able to reflect on the Job creation vs. environmental protection, job creation vs. lifestyle improvement, lifestyle improvement vs. environmental contribution. Understanding cyclic growth, momentum building and snowball effects of regulatory commitments - both good and bad

Text/ Reference Books

(regulatory frameworks, guidelines and their interpretations provided by each of the authorities)

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

Saksena K.D ; Environmental policies and programs in India

PROFESSIONAL ELECTIVE - III

B. EMERGING GLOBAL SCENARIO

Course Code	20ASH37B	CIE Marks	100
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	-
Credits	02	Exam Hours	-

Objectives

The Course is developed to focus on understanding the various approaches being taken globally for sustainability and how the solutions have come about in their local context of geography, climate, political need, lifestyle and culture, people's expectations and environmental importance.

Module/Outline

1. International Projects -
   i) Award winning Architectural Projects from around the world as a case study
   ii) Sustainable cities and infrastructure, solutions for scale, increasing urbanization, population
   iii) Large scale sustainability - limiting transit, alternate mobility, technology impacts such as work from home, greening productively - urban farming, other unique scalable solutions.
   iv) Global examples for rural, semi-urban and peri-urban development - low cost, local and eco-friendly solutions - beyond basic sustenance to creative ideation for and rejuvenated, reinterpreted, reused and repurposed solutions from traditional, local lifestyle and systems.
   v) Public Housing Solutions for low density-low-rise, high density-low-rise, high density-high-rise environments and lifestyles, economic opportunities and other solutions can be better resolved in such scenarios for best and most sustainable solutions for the people whose lives are being transformed.

International Comparatives and potential contextual Application: A look at international building regulations, standards and sustainability indices to see how they provide better or more unique solutions for their context - and how this may apply to our context - whether it is for the constantly changing Mumbai's high density urban skyline or for the ancient low rise high density Varanasi or a clean and green 20th century planned city like Bhubaneswar / Chandigarh seeking to reinvent its economic positioning.

Building new Greenfield cities (Songdo, Korea; Punggol, Singapore; Putrajaya&PetalingJaya,Malaysia; Amaravati&Naya Raipur, India; Cuidad Guyana, Venezuela; King Abdullah Economic City, Saudi Arabia; Dubai & Abu Dhabi, UAE) vs. rebuilding old ones through interventions in building codes and performance solutions (New York, USA, Copenhagen, Denmark; Amsterdam, The Netherlands; Lisbon, Portugal)

4. Activism and Stakeholder engagement
   a. Global upheavals against development in specific areas, reactions, guidelines development and solutions that they have come up with
   b. Comparative study of developing nations and high impact projects from the last 20-30 years that can be revisited with new age ideas to be more sustainable (case study style exercise - using current scenario vs. application of another solution to overcome issues with a case study of that to prove its applicability) Recommended in Groups of 3-4.

Course outcomes:

- Student will be able to understand multiple scenarios in the developed and developing world as we transform India.
- Students will also be able to understand that context and impact go hand in hand and all solutions have a level of application that is very dependent on local context, culture and lifestyles of people.
- Students will be able to reflect on to where the initiative is being taken up, solutions may vary significantly - globalized urban high density developments may need some cultural and contextual modifications to make them suitable for use, while peri-urban and rural areas can gain better infrastructure and services, while appreciating and better understanding the cultural values while bringing in the improved lifestyle to ensure that one does not wipe out the other.

Text/ Reference Books

International and National projects Detailed project reports

PROFESSIONAL ELECTIVE - III

C. PLANNING FOR ECO TOURISM

Course Code	20ASH37C	CIE Marks	100
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	-
Credits	02	Exam Hours	-

Objectives

The Course is developed to focus on creating an ecotourism industry and the challenges around it - from the impact on the environment, the construction materials and operational choices - how this industry needs to give back to ensure the ecological context is preserved, protected and to potentially even fund or finance the research and development in the area

Module/Outline

1) Bringing in People to monetize an asset and its implications -
a) How many people is too many people, is the local context capable of supporting a certain number of people, what are the limiting factors, how can they be mitigated, is it possible to segregate interference, protect the environment or is it easier to control the tourists by keeping them contained.
b) Case studies of Safaris, endangered species protected areas, natural environments - such as mangroves, unique grasslands, nesting grounds etc.
c) Monetary returns - can the cost of development of eco-sensitive measures be recovered through ticketing, one-time fundraising, overall taxation of the hospitality industry with local cess or other special project development fees.
2) What is target audience, positioning and level of service from a design, and planning perspective
a) How do we curate environments for specific user groups to ensure that we can provide different solutions for different economic segments, age groups of visitors and other specific expectations of the targeted audience for the businesses.
b) Can planning ensure separation of exclusivity and open public access while ensuring that we benefit and serve the maximum audience, but ensure viability, exclusivity and where needed.
c) How can research tourism and other niche segments help through partnership building
3) Actual impacts of development, infrastructure and supplementary products
a) Going from small scale issues to large scale - how do specific Operational choices such as in soaps, reuse of towels and sheets and chemical treatment for pools, lighting and energy efficiency etc. affect the overall sustainability performance of a development. Can we reduce the negative impact from pollution by using natural products rather than chemicals
b) The potential for off grid self-contained solutions vs. grid connected infrastructure and cost of providing that connectivity in terms of environmental impact - is it good or bad based on location and density of use planned
c) Construction and Capital investment - choice of materials, equipment and development densities and phasing (short disturbance to environment vs. prolonged disturbance)

Course outcomes:

- Students will be able to reflect on multiple user, owner, operator and environmentalist perspectives on such initiatives.
- Students will be able to analyse and interpret the potential for these fund research and development, protection and environmental upkeep, vs. just being a private business driver for profiteering.
- Students will be able to come up with solutions onhow we can do it without causing much harm, while supporting R&D, protection and other environmental initiatives.

Text/ Reference Books

International Cases in Sustainable Travel & Tourism

Green Growth and Travelism: Letters from Leaders, by Geoffrey Lipman , Terry DeLacy , Shaun Vorster , Rebecca Hawkins , Min Jiang

Taking Responsibility for Tourism by Harold Goodwin, 2011

Sustainable Tourism in Island Destinations, Rachel Dodds and Sonya Graci

PROFESSIONAL TRANINING / INTERNSHIP			
Course Code	20ASH38	CIE Marks	-
Teaching Hours/Week (L:P:SDA)	-	SEE Marks	100
Credits	02	Exam Hours	Min. 30 mins/student

Objectives

To provide exposure to the various aspects of Sustainable development and Architecture practice.
Internship/Professional practice provide students the opportunity of hands-on experience that include personal training, time and stress management, interactive skills, presentations, budgeting, marketing, liability and risk management, paperwork, equipment ordering, maintenance, responding to emergencies etc. The objective are further,

- To expand thinking and broaden the knowledge and skills acquired through course work in the field.
- To relate to, interact with, and learn from current professionals in the field.
- To gain a greater understanding of the duties and responsibilities of a professional.
- To understand and adhere to professional standards in the field.
- To gain insight to professional communication including meetings, memos, reading, writing, public speaking, research, client interaction, input of ideas, and confidentiality.
- To identify personal strengths and weaknesses.
- To develop the initiative and motivation to be a self-starter and work independently

Module/Outline

The student will be exposed to preparation of sustainable drawings, detailed project reports, preparation of feasibility report, computer applications in design and drafting, filing system in respect of documents, drawing and preparation of tender documents.

Course outcomes:

- Training Report: This shall contain copies of only such drawings, which have been dealt, drafted or designed by student. It shall also contain a brief description of works handled during the training.
- Report Study – This shall include a detailed critical study of a project from the office related to Sustainable development.

At the end of the course the student will be able to:

- Gain practical experience within industry in which the internship is done.
- Acquire knowledge of the industry, experience the activities and functions of professionals.
- Develop and refine oral and written communication skills.
- Identify areas for future knowledge and skill development.
- Expand intellectual capacity, credibility, judgment, intuition

VIVA pattern:

- The exam shall be conducted as a panel jury exam, which shall be minimum of 30mins/ student, where the student shall present the work in the form of sheets.
- Discussions, presentations, and studies will cover all the topics.
- The portfolio covering all the assignments shall be presented for term work

*** END OF III SEMESTER***

THESIS PROJECT			
Course Code	20ASH41	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	05:10:16*	SEE Marks	60
Credits	18	Exam Hours	Min. 30 mins/student

Objectives

The Course aims to give the students an opportunity to go through the entire process of project conception, and development of a sustainable project from conception to realization. They will be on a path to present a case for a project, justify the decision making from an economic, environmental and empathetic perspective. They will go through the process of handling various panels of review to get their project cleared for success.

Modules/Objective

1. A project will have to be conceived individually (ideate over the semester break + initial discussion with advisor followed by *2 weeks* to formulate and update the problem statements as below)
    a. a Business Plan needs to be created defining its mission, goals and objectives
    b. an Environmental Plan needs to be created with commitments, overall vision and objectives
    c. a Social Sustainability Plan will have to be created that outlines cultural and social impacts
2. Outlining the goals, commitment and performance metrics for each of the plans to be submitted after doing conceptual plans of the project and schematics. These will be held as key commitments for performance at the second viva. *(4 weeks)*. Project deliverables (applicable for each stage):
    a. Social Commitments to stakeholders - such as existing community (rehabilitation and resettlement (R&R) and community future), users of proposed development (their demands for best in class facilities, and ease of doing business and managing and reporting their commitments on environmental compliance etc.), company employees and staff involved in the project (safety, security, amenities during the construction phase) etc.
    b. Environmental Commitment to Stakeholders - Development of assets for use by people under R&R, facilities and assets for ease of doing business and ensuring compliance to environmental commitments by new users (Centralized CETP, Pollution monitoring, certified services, Zero Liquid discharge, Green belt development and maintenance, water and flood management etc.
    c. Business case for developer/owner and ability to maximize revenues and values through commitments made for social and environmental reasons. Alternate revenue streams from Environmental assets, potential to use additional economic assets created in support of the R&R community as revenue streams for the development / business case.

3. *(The deliverables will be presented as drawings, schematics, flow charts, business plans, regulatory compliance checklists and associated written strategies - explained with necessary technological, engineering, architectural, planning diagrams, references and schematics, organization structure, policies and procedures, calculations and financial plans as needed to clearly convey the ideas.)*

4. The first Viva - Present the case to a panel providing the case for all three aspects - to get a business approval from "the Board" to go ahead with the project, to get "environmental clearance" through commitments made, and "political buy in" to make sure that locals affected will be provided a new and promising lifestyle ahead *(1 week)*
    a. Presentations: (in three sessions)
        i. Presentation 1 - to a viva committee and peers that will act as the "Company Board"; changes to be incorporated before going to presentation 2.
        ii. Presentation 2 - to a viva committee and peers that will act as the "Environmental agency";

changes to be incorporated before going to presentation 3.

iii. Presentation 3 - to a viva committee and peers that will act as "local political and community leaders" wanting to ensure that the people's social needs are addressed effectively.

5. Outlining the goals, commitment and performance metrics for each of the plans to be submitted after doing the detailed version of the proposals. These will be evaluated against the commitments made earlier. *(4 weeks)*.
6. The Second Viva - Present the case to the same panels with their feedback incorporated into the various aspects with the Detailed version of the proposal working out all aspects to the extent necessary to convince them of the project providing the case for all three aspects - to get a business approval from "the Board" to go ahead with the project, to get "environmental clearance" through commitments made, and "political buy in" to make sure that locals affected will be provided a new and promising lifestyle ahead *(1 week)*
    a. Final Presentations: (in three sessions)
        i. Presentation 1 - to a viva committee and peers that will act as the "Company Board"; changes to be incorporated before going to presentation 2.
        ii. Presentation 2 - to a viva committee and peers that will act as the "Environmental agency"; changes to be incorporated before going to presentation 3.
        iii. Presentation 3 - to a viva committee and peers that will act as local political and community leaders wanting to ensure that the local population is addressed effectively.
7. A post-mortem analysis of the process, its sufficiency and areas where there are hurdles that need to be resolved - both good and bad -
    a. Potential issues with regard to regulations, guidelines and rating systems that do not allow you to present your compliance effectively for "environment clearance" and areas that though have been addressed do not make an impact when evaluated.
    b. Areas where the systems and process favoured the implementation, but you felt the impact could have been better but you were unable to stretch yourselves within the limited regulatory requirements to convince "the board" to spend on those initiatives.
    c. Areas where the regulations do not call for and environmental guidelines do not address the needs for the people, but given the chance the business case will still allow something like that if we were to stretch the business case by adding an additional business initiative that could function successfully. Provide a presentation on this to the advisor *(3 weeks)*.
8. Incorporate some of the suggestions made by you into the overall Business Plan, Environmental Plan and Social Sustainability Plan that will enhance the overall intent of the project - and suggest additional means and methods that could be used to ensure that all three are sustainable - such as use of government grants or schemes to fund aspects of it, adding a new supplementary business plan to address some social or environmental causes, additional environmental protections or such initiatives that could be funded using additional local taxes, cess, regulatory fees which will still be feasible. *(3 weeks)*
9. Final Viva - presenting your finding, the improvements made and potential scope of stretching the solutions beyond the ordinary requirements to make it fully sustainable. All previous Panelists and Advisor will be part of the final Viva *(1 week)*

Course outcomes:

- Students will be able to develop a strong project outline, without applied thoughts to all aspects of the project
- Present a compliant case that covers all technical requirements of the project with strategies that will show technical acumen in being able to respond to the requirements of the regulatory frameworks, rating systems and other evaluation systems available

- Students will be able to go beyond the normal and understand how this can be stretched to maximize sustainability in the given context by addressing out of the box ideas and developing solutions to resolve them - not just compliant by being truly sustainable.

Note to Guides and Students in Project Selection for Thesis:

It is important to look at the complexity of the overall project in the context of issues to be addressed and the flow of arguments that will build this narrative for it and the solutions that can be provided. The student's success is not necessarily linked to the complexity of scale of the project but more on the issues that need to be overcome and the value additions that can be made to the process - hence everything from a rural rehabilitation scheme to eco-tourism, industrial parks, smart cities (Greenfield or Brownfield) can be taken up pursuant to the ability of the student to address all of these steps as a process and come through it with an understanding of how to truly be sustainable

VIVA pattern:

- The exam shall be conducted as a panel jury exam which shall be minimum of 30 mins/ student, where the student shall present the work in the form of sheets.
- Discussions, presentations, and studies will cover all the topics.
- The portfolio covering all the assignments shall be presented for term work

Text/ Reference Book

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

DISASTER MITIGATION & MANAGEMENT			
Course Code	20ASH42	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	01:01:01	SEE Marks	60
Credits	02	Exam Hours	03

Objectives

The Course is developed to focus on environmental and social sustainability focused disaster mitigation and management as opposed to being only driven by calamities of a natural disaster.

Module-1

Understanding what constitutes a disaster and defining its parameters. The point of no-return beyond which the sustenance of the project, current way of life etc. are threatened to come to an end because it cannot be sustained economically, environmentally or culturally

Module-2

Understanding that Disaster Scenarios are many, and when we look at it from a sustainability perspective, our responses to them change significantly.

Module-3

Cultural change and its impact on sustenance leading to disaster scenarios. The abandonment of a lifestyle or practice as it is deemed non-lucrative, non-respectable or culturally demeaning. What are such scenarios, how can this be changed, and what kind of training, incentives - either monetary or otherwise be used to mitigate these circumstances.

Module-4

Economic Disaster - when the current way of life, environment or business cannot be continued due to it being unviable economically, what can be done to position the initiatives better, improve the situation on the ground, develop alternative business models and potentially look at funded, subsidized or grant based models for boosting short term to long term recovery solutions needed for them.

Module-5

Environmental Disaster - destruction of the environment, threat to species from man, business or other natural causes, devising protection against human interference if appropriate, from businesses by legislation, regulation or incentives, from nature itself such as building protective measures (anti-erosion sea walls, afforestation de-silting etc.)

Course outcomes:

- Students will be able to analyse and understand that giving importance to the stakeholders, the economic scenarios and the environment is equally important for success
- Responses that are not sensitive to potentially adverse outcomes or are not fully resolved from all three perspectives will fail due to the inability to either fund, protect or continue to enjoy and take pride in doing what they do.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module

Text/ Reference Books

Disaster Mitigation by Harsha k Gupta

Natural Hazards and Disaster Management: Vulnerability and Mitigation, R P Singh

*** END OF IV SEMESTER***