

Agenda 1- Scheme and syllabus updated -M.Des Sustainable Design

- Discussed the syllabus content of MSD302 Research Seminar and Case Study and MSD302 Research and communication Skills and made some changes.
- Discussed that MSD 300 Practical Training should include some extra points for training.

S.no.	Subject name	Changes
1	MSD30 1Research Seminar and Case Study	SVE
2	MSD302 Research and communication Skills	TE
3	MSD 300 Practical Training	Add on points <ul style="list-style-type: none">• Materials project• Renewable Energy• DST live project• UNDP projects• Reserch projects



VIVEKANANDA GLOBAL UNIVERSITY, JAIPUR

(Established by Act 11/2012 of Rajasthan Govt. Covered u/s 2(f) of UGC Act,1956)

FACULTY OF DESIGN

SCHEME & SYLLABUS

FOR

M.DES – SUSTAINABLE DESIGN

Version	2.2
Applicable for Back Examination (Session)	Session 2016-17 , 2017-2018, 2018-2019
Date of BOS/BOE/AC	BOS-04/05/2019/BOF-04/05/2019/AC- 20/ 07/2019
Page No. Where Major/Minor Changes have been done	Page No
Implemented from (Session)	Session 2019-2020
Scheme and Syllabus Page Number	Scheme-4-5 , Syllabus - 8to 29

Total Credit of the Program

Semester	I	II	III	IV	Total
Credit / Semester	18	18	24	12	72

SESSION: 2019-2020

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PROGRAMME DETAILS

Name of programme	Master in Sustainable Design
Duration of Programme	2Years
Programme Outcome	<p>Students taking admission to this program of M.Des are expected to get equipped with following outcomes:</p> <p>a Explaining the basic scientific principles and methods of Sustainable design and materials</p> <p>b. Inculcating thinking and awareness among the student.</p> <p>c. Ability to handle the unexpected situation by critically analyzing the problem.</p> <p>d. Understanding the issues related to nature and environmental contexts and sustainable development.</p> <p>f. function effectively as an individual , and as a member or leader in diverse project teams</p>
Programme Specific Outcomes	<p>a. Create, select and apply appropriate techniques, resources and modern technology in Sustainable Design and environment</p> <p>b. Prepare students for prominent career in different industry (GRIHA ,BEE,IGBC, GEM Energy consultant Environmental Consultant , Sustainability Consultant)</p>

Total Credit of the Program

Sem	I	II	III	IV	Total
Credits	18	18	24	12	72
SGPA					CGPA

M.DES – SUSTAINABLE DESIGN

Semester-I

S.No	Subject code	Subject Title	Teaching Hours			Total Hours	Credit	ET-Exam Duration (Hours) (Type)	Internal Marks	External Marks
			Lecture	Tutorial	Practical					
1.	MSD 101	Theories and Principles of Sustainability	2	2	-	4	3	2 / TE	50	50
2.	MSD 102	Sustainable Policies and Practices	1	1	1	3	3	2 / TE	50	50
3.	MSD 103	Sustainable materials and Techniques	2	2	-	4	3	2 / TE	50	50
4.	MSD 104	Project Management	2	4	-	6	4	2 / TE	50	50
5.	MSD 105	Case Study / Project	2	3	1	6	5	NA / SVE	50	50
		Total	9	12	2	23	18		250	250

Semester-II

S.No	Subject code	Subject Title	Teaching Hours			Total Hours	Credit	ET-Exam Duration (Hours) / Type	Internal Marks	External Marks
			Lecture	Tutorial	Practical					
1.	MSD 201	Alternative Energy Fundamentals	2	2	-	4	3	2 / TE	50	50
2.	MSD 202	Advanced Services and Technology	2	2	-	4	3	2 / TE	50	50
3.	MSD 203	Sustainability Management and Certification	1	1	1	3	3	2 / TE	50	50
4.	MSD 204	Introduction to Sustainability assessment Software's	2	2	-	4	3	NA / SVE	50	50
5.	MSD 205	Case Study / Project	2	2	2	6	6	NA / SVE	50	50
		Total	9	9	3	21	18		250	250

Semester III

Practical Training

S.No	Subject code	Subject Title	Teaching Hours			Total Hours	Credit	ET-Exam Duration (Hours) (Type)	Internal Marks	External Marks
			Lecture	Tutorial	Practical					
1.	MSD 300	Practical Training	Practical training of 6 weeks in some reputed construction/Architectural/Environment/Sustainable consultant firm.			6	6	NA / SVE	50	50
			Training to be taken up in Summer term between Second semester and third semester.							
2.	MSD 301	Research Seminar and Case Study.	2	4	-	6	4	NA / SVE	50	50
3.	MSD 302	Research and communication skills	2	2	-	4	3	2 / TE	50	50
4.	MSD 303	Corporate Sustainability And auditing	1	1	1	3	3	2 / TE	50	50
5.	MSD 304	Dissertation	1	2	4	8	8	NA / SVE	50	50
Total			07	08	05	21	24		250	250

Semester-IV

S.No	Subject code	Subject Title	Teaching Hours			Total Hours	Credit	ET-Exam Duration (Hours) (Type)	Internal Marks	External Marks
			Lecture	Tutorial	Practical					
1.	MSD 401	Thesis	6	6	2	14	12	NA / SVE	50	50
Total			6	6	2	14	12		50	50

Note:

1. **Theory Examination (TE):** Theory exam
2. **Sessional Viva-Voce Examination (SVE):** Portfolio examination (as Practical exam) shall be conducted through viva-voce by external examiner.
3. **Sessional Viva-Voce Examination (SVE):** Portfolio examination/ Presentation (as Practical exam) shall be conducted through viva-voce in the subject of Thesis (MSD 401) by external examiner.

List of Skill Enhancement Course (SEC)

I semester	
MSD 104	Project Management
II semester	
MSD205	Introduction to Sustainability assessment Software's
III semester	
MSD203	Corporate Sustainability And auditing

Evaluation Scheme

SCHEME OF EVALUATION FOR THEORY COURSES

Midterm I	Midterm II	08 Components (Quiz/ Assignment/ class test)	End Term Exam	Total
5%	5%	40%	50%	100%

SCHEME OF EVALUATION FOR PRACTICAL COURSES

Midterm I	Midterm II	08 Components (Quiz/ Assignment/ class test)	End Term Sessional Viva-Voce Examinations (SVE)	Total
5 Marks	5 Marks	8*5=40 Marks	50 Marks	100 Marks

- Practical and Theory courses are mention in the format as L-T-P where

L- Lecture

T- Tutorial

P- Practical

- No zero credit course is there in the scheme
- Time duration of Midterm Examination will be 60 minutes.
- Time duration of Endterm Examination will be three hours for theory and practical courses.

Syllabus for M.Des.

MSD 101 Theories and Principles of Sustainability		
Course No.: MSD 101	Course Title: Theories and Principles of Sustainability	Credit: L-T-P :2-2-0
Exam Duration: 2 hr	Exam : Theory Examination	Max Marks: 100

OBJECTIVE:

This course objective is to provide a holistic overview of various aspects related to making the built environment sustainable.

CONTENTS:**Unit I: Sustainability: Notion and Evolution**

Timeline of sustainable development, UNDP - Sustainable Development Goals, Sustainability in Business - Restorative Design Approach; C2C approach; Sustainable Materials & its application; Advance Building Services Design and Technology; Sustainable Business Case Study.

Unit II: Sustainability: Types & Theoretical Framework

International Summit and Agenda; Advent of Green Building Concept, Process and Certification, Measuring Sustainability – Energy and Daylight Modeling Software; Case Study – Incorporation of Energy and Daylight Model.

Unit III: Sustainable Built Form: Assessment

Measuring Impact – Life Cycle Analysis, Introduction to Air Quality and Water Quality – Impact & Prevention; Assessment of onsite Water & Energy Measures.

Unit IV: Sustainable Built Form: Exemplars

Case Study - Sustainable Cities; Fundamentals of Energy Conversion.

Suggested Readings:

1. *Tillman Lyle, J (1996) Regenerative Design for Sustainable Development, John Wiley & Sons.*
2. *Van der Ryn, S (1995) Ecological Design, Island Press.*
3. *Owen Lewis, J (1999) A Green Vitruvius - Principles and Practice of Sustainable Architectural Design, James & James.*
4. *Orr, W. D. (1992) Ecological Literacy: Education and the Transition to a Postmodern World, State University of New York Press.*
5. *Lovelock, J (2000) GAIA: A New Look at Life on Earth, Oxford University Press.*
6. *Tanzer K & Longoria, R (eds) (2007) The Green Braid: towards an architecture of ecology, economy and equity, Routledge.*
7. *Guzowski, M (1999) Daylighting for Sustainable Design, McGraw-Hill Professional Engineering Series*
8. *Olgay, V (1973) Design with Climate: Bioclimatic approach to architectural regionalism, Princeton University Press.*

MSD 102 Sustainable Policies and Practices		
Course No.: MSD 102	Course Title: Sustainable Policies and Practices	Credit: L-T-P : 1-1-1
Exam Duration: - 2 hr	Exam : Theory Examination	Max Marks: 100

OBJECTIVE:

To gain understanding of the new policies in response to sustainable development and to learn from various advanced practices of sustainability around the world and in Indian context.

CONTENTS:**Unit I: Energy efficient and green buildings**

- Introduction to Clean Energy and its derivation from Climate Change;
- Energy and Environment: World/Asia Energy and Business Outlook
- Building types and Energy Usages
- The principles of Integrated Design and Systems Approach
- A Case Study - Energy Efficient (Green) Buildings and subsequent benefits around the world.

Unit II: Design principles and strategies: Health, Materials, Water and Waste

- Indoor Environmental Quality (IAQ): Pollutant Sources and Impacts, Predicting IAQ, Zoning for IAQ, Passive and Active Approaches for IAQ, Materials and Health.
- Sustainable Materials & Resources: Renewable Materials, Used Materials and Application.
- Water Efficiency: Conservation and Recharge Modules & technologies.
- Waste Management: Recycling Systems, Water Reuse/Recycling.

Unit III Overview of Central Government policies and schemes

With reference to Housing and Urban Infrastructure Finance, Town Planning, Heritage Conservation etc. (eg. SMART cities, HRIDAY, AMRUT); Incorporation of CSR and subsequent development – A case study.

Unit IV: Environmental Legislations (Introduction, Understanding of Objectives and Applicability)

- EP Act 1986
- Air (Prevention and Control of Pollution) Act
- Water (Prevention and Control of Pollution) Act
- The Real Estate (Regulation and Development) Act
- Land acquisition act
- Indian Forest Act
- Wildlife Act
- Ancient Monuments and Archaeological Sites and Remains Act
- Hazardous Waste Management and Handling Rules / Bio-Medical Waste Management Rules of 2016/ Solid Waste Management Rules

- Environment Tribunal Act
- Building Construction Workers Act 1996

Case Study – Implication of legislation in Recent Scenarios.

Suggested Readings:

- *Relevant Acts and Publications of Government / Autonomous bodies and other Agencies*

MSD 103 Sustainable Materials and Techniques		
Course No.: MSD 103	Course Title: Sustainable Materials and Techniques	Credit: L-T-P : 2-2-0
Exam Duration: - 2 hr	Exam : Theory Examination	Max Marks: 100

OBJECTIVE:

The course objective is to present a value system for selecting environmentally preferable products and an overview of green, sustainable building materials and techniques of using them.

CONTENTS:**UNIT-I: Concepts of Sustainable Building Materials**

Definition of sustainable building materials through a lens of social, environmental and economic impacts, Physical properties and embodied energy of building materials, Life-cycle-analysis (LCA) – Software Approach, Third party certification of materials selection tools for better decision making in relation to their energy and environmental impacts and benefits, Impacts of selecting durable and environmentally responsible building materials: recycle, reuse, waste prevention, biodegradability

UNIT-II: Traditional and Contemporary Building Materials

Wood based materials different species of wood, bamboo, reed, coconut, thatch, sea weeds, Earth based materials adobe, burnt bricks, Stone based materials different types of stone, Lime based materials different types of lime, Cement, concrete and Ferro cement, Steel, stainless steel, aluminum, and other metals, aluminum composite panel, Glass and its different types, curtain wall, Plastics, Polymers and composite, Pre-fabricated and pre-engineered building components, New materials: fabric and digital technologies, nanotechnology, regenerative plastics.

UNIT-III: Alternative Building Materials

Overview and definition of alternative or appropriate building materials, Alternative materials developed and promoted by government organizations CSIR labs: CBRI and SERC, ASTRA (IISc), BMTPC, HUDCO and its building centers, Alternative materials developed and promoted by non-government organizations DA, Autryville, TERI

UNIT- IV: Sustainable Techniques

Prefabricating Materials in Controlled Environments, Construction Waste Management, Managing the Site for Improved Environment, Lean Manufacturing to Reduce Energy, Material Selection

Suggested Readings:

1. Anink, D, Boonstra, C & Mak, J (1996) *Handbook of sustainable building: an environmental preference method for selection of materials for use in construction and refurbishment*. James and James (Science Publishers) Limited.
2. CBRI (1990) *Building materials & components technology for developing countries*, Central Building Research Institute.

3. *Jagdish KS & Nangunda KS (2002) Proceedings of the national workshop on alternative building methods.*
4. *Krewinkel, HW (1998) Glass Buildings: Material, Structure and Detail. Princeton Architectural Press.*
5. *Schwartz, MM (2006) New materials, processes and methods technology. Taylor & Francis/CRC Press.*
6. *Watson Donald (2000) Time saver standards for building materials and systems. McGraw Hill, NY.*

MSD 104 Project Management		
Course No.: MSD 104	Course Title: Project Management	Credit: L-T-P : 2-4-0
Exam Duration: - 2 hr	Exam : Theory Exam	Max Marks: 100

OBJECTIVE:

To introduce and study formulation, costing, appraisal and finance of construction projects.

CONTENTS:**Unit- I: Basics of Project Management:**

- Why project management, what is project, what is non project, what is project management, role of a project manager, organizational influences, processes, introduction to PMI and PMBOK, processes, process groups and knowledge areas of project management

Unit- II: Project manager as an integrator and Leader:

- Project Integration Management, Project, Triple Constraints of Project Management- scope, time and cost
- Project - Resources, Communication, Risk and Stakeholder Management

Unit –III: Quality and Procurement Management:

- Quality planning, Managing Quality, Quality Control, cost of quality, quality checklists
- What is procurement, what is contract, Types of contracts, components of a contract, contract administration

Unit-IV: Software application for project Management

- What is MS Project, types of calendars, creating WBS, adding activities, predecessor / successors, critical path, float, milestones, how to create a schedule for a construction project

REFERENCES

1. *Prasanna Chandra, "Projects -Planning Analysis Selection Implementation & Review", Fourth Edition., Tata McGraw Hill Publishing Company Ltd., New Delhi.2005.*
2. *Joy P.K. "Total Project Management - The Indian Context (Chapters 3 7)", New Delhi, Macmillan India Ltd., 2002.*
3. *"United Nations Industrial Development Organization (UNIDO) Manual for the preparation of Industrial Feasibility Studies", (IDSI Reproduction) Bombay, 2007.*
4. *Barcus. S.W and Wilkinson.J.V. "Hand Book of Management Consulting Services", McGraw Hill, New York, 2006.*
5. *Joy PK (2008) Handbook of Construction Management, Macmillan Indian Ltd.*
6. *NICMAR (1990) Construction Machines & Equipment, National Institute of Construction Management and Research.*
7. *Weist, JD (1977) A Management Guide to PERT/CPM: With GERT/PDM/DCPM and Other Networks, Prentice Hall.*

MSD 105 Case Study Project		
Course No.: MSD 105	Course Title: Case Study Project	Credit: L-T-P : 2-3-1
Exam Duration: - N/A	Exam : Sessional Viva-Voce Examination	Max Marks: 100

OBJECTIVE:

Identify and conserve the untapped values and principles of vernacular design theories for architectural creations, Highlight needs and various ways of vernacular building research, analysis, presentation of, finding and its application to contemporary buildings

CONTENTS:**Unit I: Case studies of works of Designers and Architects in Contemporary World Architecture**

Case studies of works of Designers and Architects in Contemporary World Architecture (outside Indian subcontinent) whose works are influenced by the Vernacular Design of the region.

Unit II: Case studies of works of Designers and Architects in Contemporary Indian Styles

Case studies of works of Designers in Contemporary Indian Style; whose works are influenced by the Vernacular Architecture of the region

Suggested Readings:

1. *Vernacular Architecture: An Illustrated Handbook* By R.W. Brunskill, 4th ed 2000 Faber and Faber ISBN-10: 0571195032
2. *Architecture Without Architects: A Short Introduction to Non-pedigreed Architecture* by Bernard Rudofsky
3. *Bhatia, Gautam, Laurie Baker, Life, Work, Writings, New Delhi, India, 1994, Penguin Books, ISBN 0-14-015460-4*
4. *Voluntary Agencies and Housing: A Report on Some Voluntary Agencies Working in the Field of Housing in India, by Madhao Achwal. Published 1979 UNICEF*
5. *Handmade Houses and Other Buildings The World of Vernacular Architecture* By John May, 2010, Thames & Hudson
6. *Hassan Fathy- Architectural Monographs, By James Steele, 1988, St. Martin's Press*

MSD 201 Alternative Energy Fundamentals		
Course No.: MSD 201	Course Title: Alternative Energy Fundamentals	Credit: L-T-P : 2-2-0
Exam Duration: - 2 hr	Exam : Theory Exam	
		Max Marks: 100

OBJECTIVE:

The objective of course is to explore the latest in renewable and new energy technologies associated with building design

CONTENTS:**UNIT I: Introduction to Energy and Related Issues**

Historical use of energy by humans

Global energy cycles and trends

Energy consumption pattern: industry, transport, agriculture, buildings (commercial and domestic)

Sources of Energy: primary and secondary, non-renewable and renewable, conventional and non-conventional

UNIT II: Sources of New and Renewable Energy

Biomass: chemical energy, woody and agriculture crops, Energy from various types of wastes, biomass conversion: methanation, gasification, charcoal, incineration

Solar: thermal energy, flat plate or focusing or tracking collectors, air or liquid, heat exchanger, pumps, piping, valves, system controller, storage, maintenance, instrumentation, sizing, mounting and angling of collectors, closed and open loop systems, drain down and drain back systems, forced circulation and thermo-syphon

Wind Power: kinetic energy, wind mill, wind turbine, resource availability, meteorology, terrain, turbulence
Geothermal: thermal energy, the hot rocks beneath the surface of the earth, hot springs

Other sources: ocean, wave and tidal, Hydrogen and fuel cells, biotechnological and algal storage

UNIT III: Application of Renewable Energy in Buildings

Solar Energy: domestic hot water, space heating, swimming pool, commercial or industrial water heating, solar absorption air-conditioning

Solar photovoltaics: single crystal, polycrystalline and thin film technology, shading, tracking devices, power conditioning, power storage, grid interactive and stand alone, domestic lighting, street lighting, water pumping, solar cell self-repairs like a plant, photovoltaic integrated facades

Wind turbine, wind tower, wind scoops

Other applications: geothermal - heating/power generation in cold regions, biomass- cooking, mechanical applications/pumping, power generation, transportation

UNIT IV: Other Energy Issues

Overview of regional renewable energy resource assessments; the economic viability of each technology
Energy policy and guidance in India

Barriers to the implementation of renewable energy

Suggested Readings:

1. Boyle, G (2004) *Renewable Energy: Power for a Sustainable Future (second edition)*, Oxford University Press, Oxford.

2. *Gevorkian, P (2008) Solar Power in Building Design: the Engineer's Complete Design Resource, McGraw-Hill Companies Inc., USA.*
3. *Hodge, BK (2010) Alternative Energy Systems and Applications, John Wiley & Sons Inc., USA.*
4. *Kishore, VVN (2008) Renewable Energy Engineering and Technology, TERI Press, New Delhi.*
5. *Solanki, CS (2009) Renewable Energy Technologies: A Practical Guide for Beginners, PHI Learning Pvt. Ltd., New Delhi.*

MSD 202 Advanced Services and Technology		
Course No.: MSD 202	Course Title: Advanced Services and Technology	Credit: L-T-P : 2-2-0
Exam Duration: 2 hr	Exam : Theory Examination	Max Marks:100

OBJECTIVE:

To gain Knowledge about intelligent building management and energy efficient systems and application of these technologies to current building practices.

CONTENTS:**UNIT I – SERVICES IN HIGH RISE AND COMPLEX BUILDINGS**

Water supply & Plumbing systems in high rise building complexes and complex structures, Sanitation and Waste disposal systems in high rise building complexes and complex structures: Fire protection and prevention.

UNIT II – ADVANCED SERVICES DESIGN

Smart Plumbing & Drainage System Design, Electrical and Telecommunication Systems, Lighting System, Heating, Ventilation & Air conditioning systems, Acoustics Design parameters for determining the acoustical behavior of spaces

UNIT III - DESIGN AND MANAGEMENT OF INTELLIGENT BUILDINGS

Rapid risk analysis; The emergence of the intelligent office building in India, Alternative intelligent Building Scenario. Choosing and installing a Building Management System, Integration of fire and security system in Intelligent Building, Sensing and Control System. Building energy management – trends and advances in energy management systems, Building Management Systems for retrofit, Shared tenant services.

UNIT IV –DESIGN AND MANAGEMENT OF RENEWABLE ENERGY IN BUILDINGS

Clean Energy – Advent and Development;

Application:

1. Solar Energy: domestic hot water; solar absorption air-conditioning; domestic lighting, street lighting, water pumping, solar cell self-repairs like a plant, photovoltaic integrated facades etc., Current Policies
2. Solar photovoltaics: Technology and Design.
3. Alternation Clean Energy: Wind turbine, Wind Tower, Scope, Recent Advent and Urban Application.

4. Other applications: geothermal - heating/power generation in cold regions, biomass- cooking, mechanical applications/pumping, power generation, transportation

Suggested Readings:

1. *Ed. By Stephen Mc clelland, Intelligent buildings, IFS publication, 1988*
2. *Bernaden. A & R.E.Neuba, Intelligent building source book, Fairmount press inc. 1988*
3. *ABC's of Air Conditioning –Ernest Tricomi*
4. *Heating and Air Conditioning of Buildings*
5. *Environmental Science –Smith Philips and Sweenay*
6. *Mechanical & Electrical Equipment in Buildings*
7. *Sanitation, Drainage, & Water Supply – Mitchell*
8. *Drainage & Sanitation – E.H. Blake*
9. *Heating & Hot Water Supply – Hall.*
10. *Architectural Acoustics, By M. David Egan*
11. *Kishore, VVN (2008) Renewable Energy Engineering and Technology, TERI Press, New Delhi.*
12. *Solanki, CS (2009) Renewable Energy Technologies: A Practical Guide for Beginners, PHI Learning Pvt. Ltd., New Delhi*

MSD 203 Sustainability Management and Certification		
Course No.: MSD 203	Course Title: Sustainability Management and Certification	Credit: L-T-P :1-1-1
Exam Duration: 2 hr	Exam : Theory Examination	Max Marks: 100

OBJECTIVE:

To understand the regulatory and policy framework for the development of human settlements and how economy and development is to be balanced with environmental concerns.

CONTENTS:**Unit I: Economic approaches to measuring sustainable development, Measuring Wealth, Social capital**

Advent of New Currency – International market and Its impact on sustainable growth.

Unit II: Project Life Cycle – Technical, Financial, Economic, Social and Institutional feasibility of developmental projects

Live Project and Case Study.

Unit III: Concepts related to project financing, the rate of return, payback period social cost-benefit analysis etc.

Live Project and Case Study.

Unit IV: Green Building Rating Systems and Certifications

- GRIHA
- IGBC
- LEED
- ASSOCHAM- GEM
- ECBC

Suggested Readings:

- *Relevant Acts and Publications of Government / Autonomous bodies and other Agencies*
- *GRIHA; Griha Manual, Vol 1 to 5, TERI Publication*
- *IGBC Manuals, CII Publication*
- *LEED Manuals*
- *ECBC Manual*
- *ECBC User Manual*
- *Assocham GEM Manual*

MSD 204 Introduction to Sustainability Assessment Software's		
Course No.: MSD 204	Course Title: Introduction to Sustainability Assessment Software's	Credit: L-T-P : 2-2-0
Exam Duration: NA	Exam : Sessional Viva-Voce Examination	Max Marks: 100

OBJECTIVE:

The course objective is to develop an understanding of the computer simulation techniques for estimating day lighting, air flow and energy consumption in buildings

CONTENTS:**Unit I: Building Information Modelling (BIM)**

Introduction to Vernacular architecture it's nature, purpose and scope. Analytical review classification, salient BIM as tool for design, managing and documenting projects, Configurations, methodologies and standards, Capabilities and limitations of BIM, Application of BIM from conceptualization stage to design, visualization and simulation, Application of BIM in integrating and coordinating the digital models for architecture, structure, MEP (Mechanical, Electrical, Plumbing and other databases to create a complete virtual building model, Application of BIM for scheduling, calculating areas, curtain wall costing, thermal analysis

Unit II: Environmental Design Modelling

Estimate the availability and nature of sun, light, wind and other environmental elements at a site, climate analysis, Investigate the fabric performance of a design of a building, evaluate daylight, heating and cooling strategies appropriate to a specific site and brief, Evaluate how building services loads are influenced by the use, form, fabric and setting of a building

Suggested Readings:

1. Clarke J. (2001) *Energy Simulation in Building Design, 2nd Edition. Oxford: Butterworth-Heinemann.*
2. Clarke JA., Yaneske PP. and Pinney AA. (1990) *The Harmonisation of Thermal Properties of Building Materials BRE Publication & BEPAC Research Report.*
3. CIBSE (2006) *Guide A: Environmental Design, London: Chartered Institution of Building Services Engineers.*

MSD 205 Case Study Project - II		
Course No.: MSD 205	Course Title: Case Study Project - II	Credit: L-T-P : 2-2-2
Exam Duration: - NA	Exam : Sessional Viva-Voce Examination	Max Marks: 100

OBJECTIVE:

- Identify and conserve the untapped values and principles in the evolution of new theories for architectural creations, Highlight needs and various ways of Technologically Modern and Advanced building research, analysis, presentation of, finding and its application to intelligent buildings.

CONTENTS:**Unit I: Case studies of works of Designers and architects in technologically advanced world**

- Case studies of works of Designers and Architects in Advanced world architecture (outside Indian subcontinent) whose works are influenced by the technologically advanced design of the region.

Unit II: Case studies of works of Designers and Architects in technologically advanced India

- Case studies of works of Designers in Advanced India; whose works are influenced by the technologically advanced architecture and design of the region

Suggested Readings:

1. Clarke J. (2001) *Energy Simulation in Building Design, 2nd Edition. Oxford: Butterworth-Heinemann.*
2. Ed. By Stephen Mc clelland, *Intelligent buildings, IFS publication, 1988*
3. Bernaden. A & R.E.Neuba, *Intelligent building source book, Fairmount press inc. 1988*
4. *ABC's of Air Conditioning –Ernest Tricomi*
5. *Heating and Air Conditioning of Buildings*
6. *Environmental Science –Smith Philips and Sweenay*
7. *Mechanical & Electrical Equipment in Buildings*

MSD 300 Practical Training		
Course No.: MSD 300	Course Title: Practical Training	Credit: L-T-P : 0-0-0
Exam Duration: - NA	Exam : Sessional Viva-Voce Examination	Max Marks: 100

OBJECTIVE:

- The course intends to give insight into Sustainable Design practice

CONTENT:

Practical training for 6 weeks is to be carried out during the summer vacation after the second semester. Trainee may undertake the training with LEED AP and (or) BEE empanelled and (or) GRIHA architectural consultants (registered with the Council of Architecture) /Environment/Sustainable consultant firm having minimum 5 years of experience and the students should obtain prior approval from the department. The students are expected to learn nuances of working on LEED, GRIHA or ECBC compliant buildings. The students will work minimum 35 hours per week and submit weekly performance reports. During practical training students are required to study various aspects, as discussed during the preceding semester course and submit a report on the following aspect

A.	General Information
	Name of Student
	Registration no. of student
	Placement of training
	Duration of training
B.	Nature of organizational enterprise (explain type of design and construction activities the organization is involved in)
C.	Organization structure and position of trainee
D.	Types of consultancy (Residential, Institutional, Commercial etc.) enclose typical documents
E.	Chronological list of responsibilities assigned to the Trainee
F.	List of the Works done during training (enclose typical work outputs)
G.	Experiences and inferences drawn during training
	Sustainable site planning
	Water management
	Energy and atmosphere
	Sustainable Building Materials & Resources
	Water management
	Energy optimization
	Health & Wellbeing (Indoor air quality)
	Building operation & Maintenance
	Innovation in Design
	ECBC compliance/ NBC compliance
	Materials project /Renewable Energy /DST live project /UNDP Project/Research Project
	Any other strategy in design
	Special features of the project work (enclose documents to explain and highlight peculiarities)
	Any other information

MSD 301 Research Seminar & Case Study		
Course No.: MSD 301	Course Title: Research Seminar & Case Study	Credit: L-T-P : 2-4-0
Exam Duration: 2HR	Exam : Sessional Viva-Voce Examination	Max Marks: 100

OBJECTIVE:

The course objective is to provide the essential tools to conduct research in Sustainable Design and to publish research findings along with relevant case studies.

CONTENTS:**Unit I: Fundamentals of Research**

- Elements of good research, types of research, research methods: qualitative, quantitative and mixed measures, Research design as a part of the designer's thinking: problem statement, literature review, critical thinking, types of hypothesis, types of sample, methods of data collection, data analysis, research proposal preparation, Information searching techniques: field study to archives and libraries, Statistical theories: regression analysis, factor analysis and multivariate analysis, Selection of research topic and case study.

Unit II: Research in Architectural Design Development

- Qualitative research: types of research survey, interviews in research, observation, physical traces, Correlational research, Experimental and quasi experimental research, Simulation and modeling research, Case studies and combined strategies

Unit III: Visual Research Methods

- Environmental measurement: landscape evaluation paradigms, visual representation and cues, recognition of building types, photo interviewing, attributes of residential environment, Image ability: environmental character, visual appraisal, Environmental mapping: cognitive mapping, direct observation, documentary techniques, photographically studying behavior

Unit IV: Report Writing and Presentation

- Research paper/report preparation: components, Methods to use information: issues of copy right, citation & referencing: Harvard and Chicago styles. End Note, Presentation techniques: oral presentation, layout, printing process, internet, overhead, power point

Suggested Readings:

1. Dwivedi, RS (2001) *Research Methods in behavioral science*, Mcmillan, New Delhi.
2. Graziano, A (1989) *Research methods process of inquiry*, Harper Collins Publishing, New York.
3. Groat, L & Wang, D (2002) *Architectural research methods*, John Wiley publication, New York.
4. Harrigan, JE (1987) *Human factors research methods*, Elsevier, Amsterdam.
5. Kothari, CR (1990) *Research Methodology: methods & techniques*, 2nd edn, Wishwa Prakashan, New Delhi.
6. Sanhoff, H (1991) *Visual research methods in design*, Van Nostrand Reinhold, New York.
7. Zeisel, J (1995) *Inquiry by Design: tools for environment-behaviour research*, Cambridge University Press.
8. Creswell, JW (2002) *Research design: qualitative, quantitative, & mixed methods approaches*. Thousand Oaks, Sage.
9. Denscombe, M (2003) *The good research guide: for small-scale research projects*. Oxford University Press, London.
10. Yin, RK (2003) *Case Study Research: Design and Methods*, 3rd edn, Thousand Oaks: Sage Publications.

MSD 302 Research & Communication Skills		
Course No.: MSD 302	Course Title: Research & Communication Skills	Credit: L-T-P : 2-2-0
Exam Duration: 2 hr	Exam : Theory Examination	Max Marks: 100

OBJECTIVE: The course aims to inculcate competences of research and communication skills for academic and professional life. For this master programme, scientific research, methods and working are of outstanding importance. They are taught and practiced all over the programme. To prepare the students for these tasks and their final thesis and the colloquium

CONTENTS:

UNIT I: Subject, subject, subject

- How to find the right subject?
- Research, collection and preparation of material
- Structure and disposition of contents
- Preliminary table of contents
- Preliminary and final subject

UNIT II: Methods of scientific research

- Scientific correctness: guidelines and principles
- Study and examination regulations
- The topics of social research
- Literature, citations and excerpts
- Formal requirements, layout and typography

UNIT III: Techniques of mental working and writing

- B. Minto: The Pyramid Principle
- Top-down thinking
- Bottom-up writing
- Objectives, strategy and time scheduling
- Self-programming and concentration
- Strategies of success

UNIT IV: How to prepare a presentation

- The written and spoken word
- Intentions and contents
- Basic rules of rhetoric
- Tools, media and graphic support
- Self-programming and mental preparation

Suggested Readings:

1. Minto, Barbara (1991) *The Pyramid Principle*, London.
2. Creswell, JW (2002) *Research design: qualitative, quantitative, & mixed methods approaches*. Thousand Oaks, Sage.
3. Jang, Yen Tsi (1995) *An Outline of Scientific Writing*.

MSD 303 Corporate Sustainability and auditing		
Course No.: MSD 303	Course Title Corporate Sustainability and auditing	Credit: L-T-P : 1-1-1
Exam Duration: NA	Exam : Theory Examination	Max Marks: 100

OBJECTIVE:

The basic objective of this course is to make the students realize the importance of values and ethics in business and acquaint them with the latest trends in corporate social responsibility.

CONTENTS:**UNIT I: Overview of CSR:**

Philanthropy; Conventional and Strategic; Environmental issues; Social issues; Labor and related issues; Ethical and Governance issues.

Corporate Social responsibility: Social responsibility of a business firm; Social responsibility of business stakeholders (owners, employees, consumers and community); response of Indian firms towards CSR

UNIT II: CSR and Consumer Protection:

Consumerism, unethical issues in functional aspects of management (sales, marketing and technology etc.); competitive strategy.

Wider concept of social responsibility: Cost-benefit analysis of corporate social responsibility and good corporate citizenship (Social / moral obligations and survival).

Ethics and human rights, balanced global environment, concern of global warming, judicious use of natural resources.

UNIT III: Energy Audit Methodology and recent trends.

General Philosophy, need of Energy Audit and Management. Definition and Objective of Energy Management, General Principles of Energy Management. Energy Management Skills, Energy Management Strategy. Economics of implementation of energy optimization projects, it's constraints, barriers and limitations, Report-writing, preparations and presentations of energy audit reports, Post monitoring of energy conservation projects, MIS, Case-studies / Report studies of Energy Audits. Guidelines for writing energy audit report, data presentation in report, findings recommendations, impact of renewable energy on energy audit recommendations. Case studies of implemented energy cost optimization projects in electrical utilities as well as thermal utilities. Instruments for Audit and Monitoring Energy and Energy Savings, Types and Accuracy.

UNIT IV: Environmental Audit

Liabilities Audits, Management Audits, Activities Audits, Environmental Management System & Quality control: EMS Introduction, Core Element, Benefits, Documentation for EMS.

Introduction of ISO 14000. Implementation of EMS Conforming to ISO 14001. OHSAS 18001 and its comparison with ISO 14001.

Suggested Readings:

1. *Velasquez (2002) - Business Ethics - Concepts and Cases, Prentice Hall, 5th edition.*
2. *Baxi C.V. and Prasad Ajit (2005): Corporate Social Responsibility, Excel Books.*
3. *Al Gini, Case Studies in Business Ethics (5th Edition).*

4. *Kaur Tripat, Values & Ethics in Management, Galgotia Publications.*
5. *Chakraborty, S.K. Human Values for Managers.*
6. *Badi, R.V. and Badi, N.V. Business Ethics, Vrinda Publications*
7. *Energy Audit and Management, Volume-I, IECC Press*
8. *Environmental audits: evaluating and responding to environmental concerns, L Leo Motiuk Practising Law Insitute, 1991.*
9. *Environmental Management, Agarwal, APH Publishing, 2005*

MSD 304 Dissertation		
Course No.: MSD 304	Course Title: Dissertation	Credit: L-T-P : 1-2-4
Exam Duration: NA	Exam : Sessional Viva-Voce Examination	Max Marks:100

OBJECTIVE:

The course aims to acquire experience of collating and critically appraising information into topics of possible research in built environment with appropriate developed literature searches.

CONTENTS:

The dissertation shall entail the following:

- Identification of an appropriate and focused research topic reflecting social and technological needs of the day
- Formulate synopsis including objectives, scope of work, methodology of work, case studies to be undertaken, site selection culminating in broad functional requirements.
- An investigation of the topic using an analysis of existing literature, case studies and other data sources
- To develop understanding of the research topic.
- Drawing informed and scientific conclusions from the research

(a) The dissertation shall be based on empirical study, field work, and textual analysis in the field of sustainable architecture. It should demonstrate candidate's capacity for analysis and judgment as also her/his ability to carry out independent viewpoint in interpretation. A dissertation may be supplemented by published work, if any.

(b) The dissertation shall present an orderly & critical exposition of existing knowledge of the subject or shall embody results of original interpretation and analysis & demonstrate the capacity of the candidate to do independent research work. While writing the dissertation, the candidate shall lay out clearly the work done by her/him independently and the sources from which she/he has obtained other information.

(c) The dissertation shall be prepared as per guidelines given in the dissertation manual. Nevertheless, the typing shall be done on both sides of the paper, the font size should be 12 point Times New Roman in 1.5 (one and a half) space but the reference and bibliography should be typed in single space in Harvard style. The paper to be used should be A-4 size and orientation should be portrait. The dissertation shall be well structured document of not more than 15000 words with clear objectives and well-argued and appropriate conclusions indicating an appropriate level of expertise. The submission format for all stages shall be print and digital. Seminars in related areas to the dissertation topic (activities and functions to be handled, building typologies, technology applied) are required to be presented at all stages during the entire semester.

Suggested Readings:

1. McMillan, K & Weyers, J (2007) *How to write dissertations and project reports*. Pearson Prentice Hall.
2. Watson, G (1987) *Writing a thesis: a guide to long essays and dissertations*, London: Longman. *Specialist bibliography according to the project*.

MSD 401 Design Thesis		
Course No.: MSD 401	Course Title: Design Thesis	Credit: L-T-P : 6-6-2
Exam Duration: NA	Exam : Sessional Viva-Voce Examination	Max Marks: 100

OBJECTIVE:

The course objective is to provide an opportunity to undertake supervised research leading to design intervention.

CONTENTS:

The project shall be independent and allow exploration of issues within the scope of the subject area and to achieve a recognizable level of expertise in the subject. The thesis will demonstrate an understanding of the relationship between architecture, energy and sustainability through an appropriate use of scientific and social science research techniques applied to an area of research in the environment of buildings.

The project shall entail the following:

- Formulation of a focused thesis topic.
- Conduct an investigation of the thesis topic using an analysis of Existing Literature – Topics Covered in previous Semesters.
- Develop understanding of the thesis topic.
- Draw informed and scientific conclusions from the research Based on the conclusion design interventions shall be made to achieve thesis objectives. The thesis report shall be well structured document of not more than 25000 words with clear objectives and well-argued and appropriate conclusions and design intervention indicating an appropriate level of expertise. The thesis report shall include all drawings to appropriate scale.

Suggested Readings:

1. Evans, D & Gruba, P (2002) *How to write a better thesis. 2nd Edition, Melbourne University Press.*
2. Murray, R (2006) *How to write a thesis. 2nd Edition, Maidenhead: Open University Press.*
3. Turabian, K (2007) *A manual for writers of research papers, theses, and dissertations, 7th Edition, Chicago: University of Chicago Press.*
4. *As appropriate for each individual thesis*

