

UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY, CHENNAI- 600 025

M. ARCH (DIGITAL ARCHITECTURE) – FULL TIME

REGULATIONS – 2015

CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :

- I. To prepare students to excel in research or to succeed in Architectural profession through global, rigorous post graduate education.
- II. To provide students with a solid foundation in digital, scientific and technological advancement to approach architectural solutions
- III. To train students with good scientific and evaluation tools so as to comprehend, analyze, design, and create architectural solutions for the real life problems.
- IV. To inculcate students in professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate architectural issues to broader social context.
- V. To provide student with an academic environment aware of excellence, leadership, written ethical codes and guidelines, and the life-long learning needed for a successful professional career

PROGRAMME OUTCOMES (POs) :

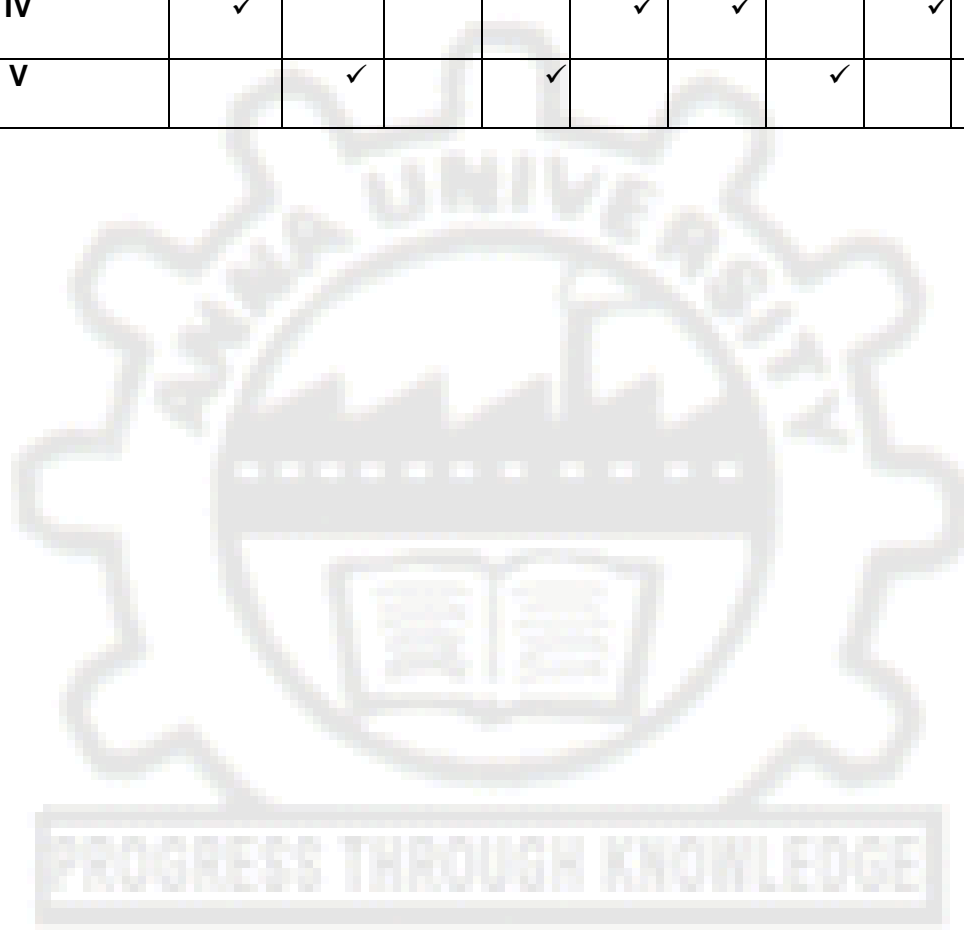
On successful completion of the programme,

1. Graduates will demonstrate knowledge of digital tools and skills and contemporary design process.
2. Graduates will demonstrate an ability to identify, formulate and solve architectural design using contemporary digital techniques.
3. Graduate will demonstrate an ability to design, analyze and interpret data to optimize the final design solutions and optimization techniques.
4. Graduates will demonstrate using the digital tools an ability to design a system, component or process as per needs and specifications – algorithms, scripting
5. Graduates will demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks.
6. Graduate will demonstrate skills to use modern engineering tools, software and equipment to analyze problems.
7. Graduates will demonstrate knowledge of professional and ethical responsibilities.
8. Graduate will be able to communicate effectively in digital form thru a variety of digital media
9. Graduate will show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues.
10. Graduate will develop confidence for self education and ability for life-long learning, learning to work as a team.

Attested

Sobhan
DIRECTOR

Programme Educational Objectives	Programme Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
I	✓	✓		✓			✓			✓
II	✓		✓			✓		✓		✓
III			✓			✓		✓		
IV	✓				✓	✓		✓		✓
V		✓		✓			✓		✓	✓



			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
YEAR 1	SEM 1	Contemporary Processes in Architectural Design	✓								✓	✓	
		Introduction to Algorithms	✓								✓		
		Introduction to Design Thinking and Innovation		✓									✓
		Elective I											
		Architectural Visualization Studio	✓				✓	✓		✓			
	SEM 2	Theory of Digital Architecture								✓			✓
		Performance Evaluation of Buildings.											
		Research Methodologies in Architecture											
		Graphical Algorithms											
		Elective II											
		Digital Design Studio I	✓	✓	✓	✓	✓	✓		✓		✓	
YEAR 2	SEM 3	Digital Production, Solid Modelling and RP	✓			✓	✓			✓		✓	
		Design optimisation through Algorithms			✓	✓							
		Elective VII											
		Design Evaluation Tools			✓	✓				✓			✓
		Dissertation		✓		✓	✓		✓				✓
		Digital Design Studio II	✓	✓	✓	✓	✓	✓		✓			✓
	SEM 4	Thesis	✓	✓		✓			✓			✓	

UNIVERSITY DEPARTMENTS
ANNA UNIVERSITY, CHENNAI- 600 025
M. ARCH (DIGITAL ARCHITECTURE) – FULL TIME
REGULATIONS – 2015
CHOICE BASED CREDIT SYSTEM
CURRICULA AND SYLLABI FOR I TO IV SEMESTERS
SEMESTER I

Sl. No.	Course code	Course name	Category	Contact periods	L	T	P/S	C
THEORY								
1.	AA7151	Contemporary Processes in Architectural Design	PC	3	3	0	0	3
2.	DG7101	Introduction to Algorithms	PC	4	2	0	2	4
3.	DG7102	Introduction to Design Thinking and Innovation	PC	3	3	0	0	3
4.		Elective-I		3	3	0	0	3
STUDIO								
5.	DG7111	Architectural Visualization Studio	PC	10	2	0	8	6
TOTAL				23	13	0	10	19

SEMESTER II

Sl. No.	Course code	Course name	Category	Contact periods	L	T	P/S	C	Pre-requisites
THEORY									Pass in ----- Architectural Visualization Studio
1.	DG7251	Performance Evaluation of Buildings.	PC	4	2	0	2	3	
2.	AA7251	Research Methodologies in Architecture	PC	3	3	0	0	3	
3.	DG7201	Graphical Algorithms	PC	5	1	0	4	3	
4.	DG7202	Theory of Digital Architecture	PE	3	3	0	0	3	
5.		Elective-II	PE	3	3	0	0	3	
STUDIO									
6.	DG7211	Digital Design Studio I	EEC	12	0	0	12	6	
TOTAL				30	9	0	12	21	

SEMESTER III

Sl. No.	Course Code	Course Name	Category	Contact periods	L	T	P/S	C	Pre-requisites	
THEORY										
1.	DG7301	Design Optimisation through Algorithms	PC	3	3	0	0	3	Digital Design Studio I ----- Pass in	
2.	DG7302	Digital Production, Solid Modelling and RP	PC	5	1	0	4	3		
3.		Elective-III	PE	3	3	0	0	3		
STUDIO										
4.	DG7311	Design Evaluation Tools	EEC	6	0	0	6	3		
5.	DG7312	Digital Design Studio II	EEC	12	0	0	12	6		
6.	DG7313	Dissertation	EEC	6	0	0	6	3		
TOTAL				35	6	0	24	21		

SEMESTER IV

Sl. No.	Course code	Course name	Category	Contact periods	L	T	P/S	C	Pre-requisites
STUDIO									
1.	DG7411	<u>Thesis</u>	EEC	22	0	0	22	11	Pass in ----- Digital Design Studio II
TOTAL				22	0	0	22	11	

TOTAL CREDIT :72

Attested

Sobhan
DIRECTOR

PROFESSIONAL CORE (PC)								
Sl. No.	Course Code	Course title	Category	Contact periods	L	T	P	C
1		Contemporary Processes in Architectural Design	PC	3	3	0	0	3
3		Introduction to Algorithms	PC	4	2	0	2	4
4		Introduction to Design Thinking and Innovation	PC	3	3	0	0	3
		Theory of Digital Architecture	PC	3	3	0	0	3
5		Performance Evaluation of	PC	3	3	0	0	3
7		Research Methodologies in architecture	PC	3	3	0	0	3
8		Graphical Algorithms	PC	3	3	0	0	3
9		Digital Production, Solid Modeling and RP	PC	3	1	0	4	3
10		Design Optimisation through Algorithms	PC	3	3	0	0	3

PROFESSIONAL ELECTIVES (PE)								
Sl. No.	Course Code	Course title	Category	Contact Periods	L	T	P	C
1.	DG7001	Building Management and Control Systems	PE	3	3	0	0	3
2.	DG7002	Digital Communication and Multimedia in design	PE	6	0	0	6	3
3.	DG7003	High End 3 D Modeling	PE	4	2	0	2	3
4.	DG7004	Introduction to Scripting	PE	4	2	0	2	3
5.	DG7005	Smart Materials	PE	3	3	0	0	3
6.	DG7006	Virtual Society	PE	3	3	0	0	3
7.	DG7007	Web Design and Portfolio Production	PE	5	1	0	4	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)								
SL. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
1.		Architectural Visualization Studio	EEC	10	2	0	8	6
2.		Digital Design Studio I	EEC	12	0	0	12	6
3.		Design Evaluation tools	EEC	6	0	0	6	3
4.		Digital Design Studio II	EEC	12	0	0	12	6
5.		Dissertation	EEC	6	0	0	6	3
6.		Thesis	EEC	22	0	0	22	11

OBJECTIVES:

- To investigate the contemporary theories of media and their influence on the perception of space and architecture.
- To provide an overview of various contemporary design processes and its relation to computation.

UNIT I INTRODUCTION**6**

Investigation of contemporary theories of media and their influence on the perception of space and architecture. Technology and Art – Technology and Architecture – Technology as Rhetoric – Digital Technology and Architecture

UNIT II ASPECT OF DIGITAL ARCHITECTURE**9**

Aspects of Digital Architecture – Design and Computation – Difference between Digital Process and Non-Digital Process – Architecture and Cyber Space – Qualities of the new space – Issues of Aesthetics and Authorship of Design – Increased Automatism and its influence on Architectural Form and Space

UNIT III CONTEMPORARY PROCESS**12**

Overview of various Contemporary design process and its relation to computation: Diagrams – Diagrammatic Reasoning – Diagrams and Design Process – Animation and Design – Digital Hybrid Design Protocols – Concept of Emergence - Introduction to Cellular Automata and Architectural applications – Genetic algorithms and Design Computation

UNIT IV GEOMETRIES AND SURFACES**12**

Fractal Geometry and their properties – Architectural applications - Works of Zvi Hecker-- Shape Grammar - Shapes, rules and Label - Shape Grammar as analytical and synthetic tools- Combining Shape grammar and Genetic algorithm to optimize architectural solutions - Hyper Surface-- Introduction to Hyper surface and concepts of Liquid architecture.

UNIT V CASE STUDIES**6**

Case studies- Study, understanding and analysis of known examples at the national and international levels which demonstrates the contemporary theories of media and their influence on the perception of space and architecture, contemporary design processes and its relation to computation.

TOTAL:45 PERIODS**OUTCOMES:**

- Understanding of the effect of contemporary theories of media on contemporary architectural design.
- Understanding of various contemporary design process and their relation to computation

REFERENCES:

1. Peter Eisenmann, Diagram: An Original Scene of Writing, Diagram Diaries
2. MOVE, UN Studio
3. Grey Lynn, The Folded, The Pliant and The Supple, Animate form
4. Contemporary Techniques in Architecture, Halsted Press, 2002
5. Ali Rahim, Contemporary Process in Architecture, John Wiley & Sons, 2000
6. Walter Benjamin, Practices of Art in the Age of Mechanical Reproduction Colin press, 1977
7. Work of Architecture in the Age of Mechanical Reproduction, Differences MIT press, 1997.
8. William J Mitchell, the Logic of Architecture: Design, Computation and Cognition. MIT Press, Cambridge, 1995
9. Marcos Novak, invisible Architecture: An Installation for the Greek Pavilion, Venice Biennale, 2000.

OBJECTIVE:

- This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice.

UNIT I THE 'C' LANGUAGE AND CONTROL FLOW STRUCTURES 12

'C' program structure – Datatypes, Variables and constants – C Operators – Input/Output – Exercises and solutions using the above said utilities - Sequential control structure – Selective control structure – Iterative Control Structure – Exercises and solutions using the above said utilities.

UNIT II ARRAYS, STRING FUNCTIONS AND POINTERS 12

Single Dimensional arrays – Multidimensional arrays – String and String functions. Pointer declaration – Initialization of pointers – Using Pointers – Exercises and solutions using the above said utilities.

UNIT III FUNCTIONS AND STRUCTURES 12

User defined functions – Function categories – Storage classes. Introduction to structures – Arrays of Structures – Structures and functions – Exercises and solutions using the above said utilities.

UNIT IV FILE HANDLING AND FILE I/O 8

Introduction to files – Character I/O from files – Line I/O with Files - Writing records onto files – Reading records from files – Exercises and solutions using the above said utilities.

UNIT V DATA STRUCTURES, STACKS, QUEUES AND BINARY TREES 16

Introduction to Data Structures – Introduction to Linked lists – Manipulation of Singly Linked lists – Doubly linked list – Exercises and solutions using the above said utilities -Introduction of Stacks and Queues – Representing Stacks in C – Queues – Binary trees – Exercises and solutions using the above said utilities.

TOTAL: 60 PERIODS**OUTCOME:**

- The student will be proficient in analysis and design of algorithms, recurrences, and techniques to solve them.

REFERENCES:

- Thinking in C++ second edition Vol. one, Bruce Eckel
- Thinking in C++ second edition Vol. two, Bruce Eckel & Chunk Allison
- The C++ programming language (3rd edition) by Bjarne Stronstrup

DG7102 INTRODUCTION TO DESIGN THINKING AND INNOVATIONL T P/S C
3 0 0 3**OBJECTIVE:**

Gain an understanding of design and design processes explore interdisciplinary applications of design thinking and gain experience in design thinking.

UNIT I INTRODUCTION TO DESIGN THINKING 6

Description of the design thinking models and stages as well as styles of thinking.

UNIT II DESIGN PROCESSES 10

Design practice from multiple perspectives, addressing how designers, teams, industries and communities create new products and services.

UNIT III DESIGN ECOLOGIES**9**

Aims to understand the contexts and relationships in landscapes of design and innovation - the materials, users, outcomes and organizations at different spatial and temporal scales.

UNIT IV COMPLEXITY AND DESIGN**10**

Applying and developing concepts and methods coming from complexity science in order to understand and support design thinking and practice.

UNIT V COLLABORATIVE DESIGN**10**

Focuses on the social aspects of designing and examines the understanding of diverse modes of engagement in design.

OUTCOMES:

- Understanding of the effect of design thinking on architectural design.
- Learning to understand the context and the social, cultural, material, economic and political situation that usually leads to trying to get clarity from a very complex set of signals and design processes.
- Understanding of various design thinking process and their relation to architectural design.

TOTAL: 45 PERIODS**REFERENCES:**

1. Lawson, B 2003, How Designers Think, Architectural Press.
2. Lawson, B 2004, What Designers Know, Architectural Press.
3. Perkins, D.N. 1981, 'The Minds best work', Cambridge, MA: Harvard University press.
4. John-Steiner, Vera, 1987, 'Notebooks of the Mind: Explorations of Thinking', New York, NY: Harper & row.
5. Michael Shamiyeh 2010, 'Creating Desired Futures', How Design Thinking Innovates Business, DOM research laboratory (ed) Birkhauser Gmbh, Basel. ISBN 978- 3-0346-0368-3. www.birkhauser-architecture.com .
6. Horst Ritlel & quoted in Buchanan, R 1992, 'Wicked problems in design thinking', design issues VIII, no.2, pp.5-21.
7. Barrat, Krome 1980, 'Logic and design: In Art, Science and mathematics', New York, NY: Design Press.
8. Schon, AD 1987, Educating the Reflective Practitioner, John Wiley & Sons.

DG7111**ARCHITECTURAL VISUALIZATION STUDIO****L T P/S C
2 0 8 6****COURSE OBJECTIVE AND PREREQUISITES:**

Specific issues dealing with form generation using the generative potential of software's unique ability to deploy geometric entities. Introduction of Shape grammars, 3D sketch boards, parametric design tools, virtual environments etc. Discussion of Visualization techniques and their potential uses for the Architectural Design and analysis.

COURSE OUTLINE:

Introduction to Virtual environments, Alpha worlds, Digital design studio concept by William Mitchell-Introduction to Hardware components such as data-gloves, Head Mounted Displays, IMAX screens, virtual cave etc-Shape grammars for form generation: Visual and spatial reasoning in Design. Introduction of features found in typical 2D & 3D shape grammars. References used in conjunction with tabular shape grammar summaries such as those for DXF, IGES, RIB, and VRML-Digital tectonics, Morphogenetic design strategies, Reflexive architecture, Hybrid spaces-Other related issues: Contemporary Digital Experimentation and the Radical Avant-garde.

TOTAL: 150 PERIODS

REFERENCES:

1. Hyper Architecture: Spaces in the Electronic Age (The Information Technology Revolution in Architecture) by Luigi Prestinenza Puglisi, L. Byatt (Translator)
2. Next Generation Architecture: Folds, Blobs, and Boxes by JOSEPH ROSA
3. Advanced Technologies : Building in the Computer Age (The Information Technology Revolution in Architecture) by Valerio Travi.
4. Hyperbodies by Kas Oosterhuis
5. Digital Tectonics by Neil Leach (Editor), David Turnbull (Editor), Chris Williams (Editor)
6. Hybrid Space: Generative Form and Digital Architecture by PETER ZELLNER
7. Developing Digital Architecture by Yu-Tung Liu (Editor), Yu Tung Liu
8. Architectural Representation Handbook: Traditional and Digital Techniques for Graphic Communication by Paul Laseau.

DG7251

PERFORMANCE EVALUATION OF BUILDINGS

L T P/S C

2 0 2 3

OBJECTIVES

- To investigate the simulation and audit techniques for assessing the energy performance, environmental response and impact of built form.

UNIT I INTRODUCTION TO BUILDING PERFORMANCE EVALUATION 6

Emerging role of performance evaluation in building design and master planning- Performance audit and rating systems- GRIHA, LEED IGBC and BREAM – Architectural Computation and performance audit- Introduction to ECOTECT.

UNIT II PRINCIPLES OF SUSTAINABLE DESIGN 15

E's of sustainability - Integrated approach to environmental design- Case studies – Comparative analysis of green rating systems, LEED, BREAM and GRIHA – Cognitive , analytical and simulated modeling and design of buildings. Zero Carbon Footprint Building.

UNIT III ENVIRONMENTAL ASSESSMENT METHODS AND MODELING FOR PASSIVE SYSTEMS 15

Modelling and experimental techniques for building assessment/ evaluation and design – Basics of thermal comfort, solar shading/access/ control, day lighting, acoustics air movement etc. – issues and opportunities with current assessment modes/ evaluation tools- Evaluation and assessment based on Building type/ function and program – Building performance with respect to function, program, micro climate, urban planning, envelope design, material – Computer studio and simulation-Mathematical models of heat and mass transfer phenomena through building components: transfer function methods and numerical methods – Models of radiative and convective heat transfer phenomena within buildings

UNIT IV ADVANCE ECOTECT AND ENERGY MODELLING 15

Integration of ECOTECT with BIM, RAPID ENERGY MODELLING - Modelling and performance simulation of existing buildings – residential-institutional- design of a new residential building with ECOTECT

UNIT V SEMINAR AND CASE STUDY PRESENTATION 9

Case study presentation of students on performance evaluation of a building identified by them and approved by the course faculty – Seminar on topics approved by the course faculty.

TOTAL: 60 PERIODS

OUTCOMES

- The students will gain knowledge on environmental assessment methods, audit and simulation techniques.
- Will add value to architectural design processes and equip students with energy modeling skills.

REFERENCES:

1. Energy Audit of Building Systems – Moneef Krarti (Ph.D) – CRC Press 2000
2. Clarke, J.A., “Energy simulation in building design”, Adam Hilger Ltd, Bristol, 1985
3. ESRU,. “ESP-r A Building Energy Simulation Environment; User Guide Version 9 Series. “ESRU Manual U 96/1, University of Strathclyde, Energy Systems Research Unit, Glasgow, 1996.
4. Kabele, K., “Modeling and analyses of passive solar systems with computer simulation”, in Proc. Renewable energy sources, PP. 39 – 44, Czech Society for Energetics Kromeriz 1998 (in Czech)

AA7251

RESEARCH METHODOLOGIES IN ARCHITECTURE

L T P/S C

3 0 0 3

OBJECTIVES

- To introduce the students to the importance of critical inquiry as a way of gaining knowledge and adding to it through research.
- To expose the students to the various forms of research and research methodologies/ processes.
- To engage this understanding in the specific field of architectural research.

UNIT I INTRODUCTION

9

Basic research issues and concepts- orientation to research process- types of research: historical, qualitative, co-relational, experimental, simulation and modeling, logical argumentation, case study and mixed methods- illustration using research samples

UNIT II RESEARCH PROCESS

9

Elements of Research process: finding a topic- writing an introduction- stating a purpose of study identifying key research questions and hypotheses- reviewing literature- using theory- defining, delimiting and stating the significance of the study, advanced methods and procedures for data collection and analysis- illustration using research samples

UNIT III RESEARCHING AND DATA COLLECTION

9

Library and archives- Internet: New information and the role of internet; finding and evaluating sources- misuse- test for reliability- ethics
Methods of data collection- From primary sources: observation and recording, interviews structured and unstructured, questionnaire, open ended and close ended questions and the advantages, sampling- Problems encountered in collecting data from secondary sources.

UNIT IV REPORT WRITING

6

Research writing in general- Components: referencing- writing the bibliography - developing the outline - presentation; etc.

UNIT V CASE STUDIES

12

Case studies illustrating how good research can be used from project inception to completion- review of research publications.

TOTAL: 45 PERIODS

OUTCOMES

- The student will develop the skill to identify, decipher and interpret issues relating to architecture based on research enquiry methods.
- The student will gain knowledge of different methods of conducting research and research writing.

REFERENCES

1. Linda Groat and David Wang; Architectural Research Methods – 2nd edition ‘,John Wiley & Sons Inc,Hoboken,New Jersey, US , 2013.
2. Wayne C Booth; Joseph M Williams; Gregory G. Colomb; ‘The Craft of Research’ , 3rd Edition; Chicago guides to writing, editing and publishing;2008
3. Iain Borden and Kaaterina Ruedi Ray ; The Dissertation: An Architecture Student’s Handbook; Architectural Press; 2006
4. Ranjith Kumar; Research Methodology- A step by step guide for beginners-3rd Edition ; Sage Publications;2011
5. John W Creswell; Research design: Qualitative, Quantitative and Mixed Methods Approaches; Sage Publications; 2011.
6. JA Smith, P Flowers, M Larkin -Interpretative Phenomenological Analysis: Theory, Method and Research (English) FIR Edition- Sage Publication -2009.

DG7201

GRAPHICAL ALGORITHMS

L T P/S C
1 0 4 3

OBJECTIVE:

This course will introduce participants to the Fundamental Concepts and Essential Skills necessary for effectively designing with graphical algorithms and aid designers who are exploring new shapes using generative algorithms.

COURSE OUTLINE:

UNIT I

Object Attributes/Parameters, Data Types, Data Structures, and Designing with Algorithm

15

UNIT II

Parametric Design and its usefulness, its relationship to Design process.

15

UNIT III

Graphical Algorithms, Use in Exploring Ideas.

15

UNIT IV

Storage and Access to Data; Manipulating Lists and Data Trees.

15

UNIT V

Best practices for integrating Graphical Algorithm editor into your Professional Workflow.

15

TOTAL: 75 PERIODS

OUTCOME:

- The students will develop the aptitude to use advanced 3d modeling, basic data collection and diagramming.
- Understanding of comprehensive use and integrated approach by using multiple platforms, allowing for easy transfer of files between applications.

REFERENCE:

1. <http://www.grasshopper3d.com/>
2. <http://lab.modecollective.nu/learning>

DG7202

THEORY OF DIGITAL ARCHITECTURE

L T P/S C
3 0 0 3

COURSE OBJECTIVE:

Computers are becoming an integrated part of our everyday life. This course aims at discussing issues of Architectural Interpretations in the contexts of culture and socio-economics with a backdrop of emerging Computer Technology.

UNIT I	INTRODUCTION TO ARCHITECTURAL INTERPRETATIONS	10
Architectural Interpretations in the contexts of culture and socio-economics.		
UNIT II	EMERGING COMPUTER TECHNOLOGIES	9
How architecture and all building industry are influenced by emerging computer technologies with the emphasis on digital design processes and digital manufacture possibilities.		
UNIT III	CHANGING CULTURES OF THE WORLD DUE TO TECHNOLOGICAL INNOVATIONS	10
Forces which contribute to the cultural change described include: colonization, globalization, and advances in communication, transport and infrastructure improvements.		
UNIT IV	ARCHITECTURAL INTERPRETATIONS	10
Rethinking Architecture Architectural Interpretations in the contexts of globalization, Super modernism, How Complexity Science Is Changing Architecture and Culture		
UNIT V	OTHER THEORETICAL ISSUES	6
Theories of globalization local contexts etc.		
		TOTAL: 45 PERIODS

OUTCOMES:

- Understanding of the architectural Interpretations in the contexts of culture and socio-economics with a backdrop of emerging Computer Technology.
- Exposing the students to write research paper based on the interpretation, expressing their own opinion.

REFERENCES:

1. Rethinking Architecture: A Reader in Cultural Theory by Neil Leach
2. Architecture Culture: 1943-1968 (Columbia Books of Architecture) by Joan Ockman
3. Architecture Theory since 1968 by K. Michael Hays (Editor)
4. Theorizing a New Agenda for Architecture: An Anthology of Architectural Theory 1965-1995 by Kate Nesbitt
5. The Poetics of Construction in Nineteenth and Twentieth Century Architecture by Kenneth Frampton
6. Complexity and Contradiction in Architecture by Robert Venturi
7. Architecture, Technique and Representation (Critical Voices in Art, Theory, and Culture) by Stan Allen
8. The Paradox of Contemporary Architecture by Peter Cook (Editor), et al
9. Ten Books on Architecture by Vitruvius, et al
10. The Architecture of the Jumping Universe: A Polemic: How Complexity Science Is Changing Architecture and Culture by Charles Jencks
11. Ontology of Construction: On Nihilism of Technology and Theories of Modern Architecture by Kenneth Frampton (Foreword), Gevork Hartoonian (Paperback - March 28, 1997)
12. Chora Four: Intervals in the Philosophy of Architecture by Alberto Perez-Gomez (Editor), Stephen Parcell (Editor)

DG7211

DIGITAL DESIGN STUDIO I

L T P/S C
0 0 12 6

OBJECTIVES:

- This course focuses in understanding various Contemporary processes and translating them into architecture.
- To compute the methods of quantifying architecture and developing Design from codified data.

The project involves in developing Design prototype to explore various contemporary processes and ideas using shape grammar, fractal, parametric models, and Biometric etc. using major software used in design and video making.

TOTAL: 180 PERIODS

OUTCOME:

- The students will develop the aptitude to use Digital Media as a medium to generate complex forms.

REFERENCES:

1. H. A Simon. Sciences of the Artificial, MIT Press, Cambridge, 1996
2. B. Colajanni and G. Pelliteri (ed.), Multimedia and Architectural Disciplines, Italy, 1996.
3. M.L. Maher, et. al, Understanding Virtual Design Studios, Verlag, London 1999
4. Robin Baker, Designing the future: The Computer Transformation of Reality.London), 1993.

DG7301 DESIGN OPTIMISATION THROUGH ALGORITHMS L T P/S C
3 0 0 3

OBJECTIVES

- To introduce students to the concepts and techniques of modern optimization theory and practice.
- To learn and analyze how design optimization enhances the design outcome.

UNIT I INTRODUCTION 6
Optimization and evolutionary design – How can Optimization support the design process-
Overview of principles, methods and tools for design optimization

UNIT II OPTIMIZATION METHOD 10
Evolutionary Design Optimization using Genetic Algorithms – Overview of traditional gradient based methods

UNIT III FUNDAMENTAL CONCEPTS OF OPTIMALITY 10
Formulation of the objective function for architectural design – Aggregating multiple objectives and multi-objective optimization – Constraint handling

UNIT IV DESIGN OPTIMIZATION PRACTICE 10
Case Studies by Students on Design Optimization in practice.

UNIT V MODELING 9
Selection of design variables, objectives and constraints- Building optimization models – Post Optimal Analysis

TOTAL: 45 PERIODS

OUTCOME:

- Students will learn the fundamentals of optimization and its support in the design process.
- Students will learn to create an appropriate simulation model of the design problem to formulate the optimization problem and use algorithmic optimization techniques and computer support tools to solve the problem.

REFERENCES

1. John S.Gero (ed), *Design Optimization*, Academic press, Inc, 1985
2. Antony D.Radford and John S.Gero , *Design by Optimization in Architecture, Building, and Construction*, Van Nostrand Reinhold, 1988
3. Panos Y. Papalambros and Douglass J. Wilde, *Principles of Optimal Design – Modeling and Computation*, Cambridge University Press, 2000
4. Mitsuo Gen and Runwei Cheng, *Genetic Algorithms and Engineering Optimization*, Wiley, 2000

DG7302

DIGITAL PRODUCTION: SOLID MODELING AND RP

L T P/S C
1 0 4 3

OBJECTIVES:

- To outline various Digital Production tool to build artifacts as part of the creative design process.
- To utilize the Prototyping and Modeling as a design medium that supports the full spectrum of digital design as a paperless process.

This course focuses on advanced 3d modeling tools with Computer numerically controlled production processes. It aims to develop prototypes that will enhance design learning. Complex virtual 3d-models would be converted to tactile models through Prototyping. This is to achieve by combining lectures on fabrication technology, exercises on CNC machines and prototyping interfaces.

Working with Stereo Lithography Machines: Introduction to the stereo lithography tools Procedures to transfer solid model into a tessellated surface file. Using Polymer resin to produce prototypes. Practical exercise will be given to model simple objects.

TOTAL: 75 PERIODS

OUTCOME:

- The students will be able to translate the design process through Digital Prototype or Model attribute.

REFERENCES:

1. Daniel Schodek, Digital Design and Manufacturing: CAD/CAM applications in Architecture and Design, John Wiley&sons, 2005.
2. Nick Callicott, Computer Aided Manufacture in Architecture, Architectural press, 2001.
3. McGraw Hill Text, Rapid Prototyping and Manufacturing: Fundamentals of Stereo Lithography, 1993
4. Paul Jacobs, Stereo lithography and Other Rpanm Technologies : From Rapid Prototyping to Rapid Tooling, Amer Society of Mechanical Engineers, 1995.
5. Michael D. Ciletti, modelling, synthesis, and Rapid Prototyping with the VERILOG (TM) HDL, Prentice hall, 1999.
6. Leu, Handbook of Rapid Prototyping and Layered Manufacturing, Academic Press, 2001.

DG7311

DESIGN EVALUATION TOOLS

L T P/S C
0 0 6 3

OBJECTIVE:

- To better understand the impact of early design delivery decisions on long-term efficiency and effectiveness of buildings
- To better understand the impact of building delivery processes and decisions on user response both initially and over the life cycle of the building.

Process of systematically evaluating the performance and/or effectiveness of one or more aspects of buildings in relation to issues such as Thermal comfort, visual comfort, aesthetics, cost-effectiveness, functionality, productivity, safety and security, and sustainability.

The course focuses on Pre-Design evaluation of learning environments and Post-occupancy evaluation of learning environments.

This course will train students on various evaluation tools in practice such as VASARI (Green Suite), IES, BIM, IAS etc. and using other convention techniques such as Questionnaire Survey, Physical Measurements of Thermal Environment, Lighting Measurements and other Environmental Measures through case studies for analysis.

TOTAL: 90 PERIODS

OUTCOME:

- Through the evaluations, a range of IEQ problems were diagnosed that would negatively influence the comfort occupants.
- To expose students to various evaluation tools used in various stages of design.

REFERENCES

1. Building Evaluation Technique by Baird, G., Gray, J., Isaacs, N., Kernohan, D., and McIndoe, G. Wellington. New Zealand: McGraw-Hill, Inc., 1996.
2. Environmental Design Evaluation by Friedmann, A., Zimring, C. & Zube, E. New York: Plenum, 1978.
3. Working with the Performance Approach in Building" in CIB Report, Publication 64 by Gibson, E.J. Rotterdam, Holland: 1982.
4. Post-Occupancy Evaluation: An Overview in Environment and Behavior 12: 429-51 by Zimring, C. & Reizenstein, J. E. 1980.
5. Post-Occupancy Evaluation by Preiser, W., Rabinowitz, H. & White, E. T. (Eds.) New York: Van Nostrand Reinhold Company, 1988.

Web links:

<http://autodeskvasari.com/>

<http://www.iesve.com/>

DG7312

DIGITAL DESIGN STUDIO II

L T P/S C

0 0 12 6

OBJECTIVE:

- To train students in using advanced Digital media involving complex situations that require handling of multiple information and algorithmic principles.

This course investigates how digital media can be employed as a generative tool for derivation of form and its transformation. This course takes designers beyond the limits of the commercial digital tools. By applying algorithmic principles, computer programs can be used for form generation. The design projects will focus on parametric modelling and proceed towards complex form generation. Students will develop a brief for a design or a product and through generative process develop complex forms.

TOTAL: 180 PERIODS

OUTCOME:

- The students will develop the aptitude to use Digital Media as a medium to generate complex forms.

REFERENCES:

1. H. A Simon. Sciences of the Artificial, MIT Press, Cambridge, 1996
2. B. Colajanni and G. Pelliteri (ed.), Multimedia and Architectural Disciplines, Italy, 1996.
3. M.L. Maher, et. al, Understanding Virtual Design Studios, Verlag, London 1999
4. Robin Baker, Designing the future: The Computer Transformation of Reality. (London), 1993.

DG7313

DISSERTATION

L T P/S C

0 0 6 3

OBJECTIVES:

- To promote research in Digital architecture and
- Train the students in collecting, critically analyzing and presenting information in a logical sequence.

Students will identify research topics and in depth explore either the theoretical issue or develop mathematical models/ algorithms. While it is not mandatory, the students subsequently carry both the findings and research into the project work. The topic has to be approved by the supervisor and periodic reviews will be held to assess the progress of the work and also facilitate exchange of ideas. The final oral submission has to be accompanied by a CD and report submission.

TOTAL: 90 PERIODS

OUTCOME:

- Student will be skilled to collect, process and present relevant information in their research topic.

OBJECTIVE:

- To develop a prototype or express theoretical issues using Digital Media in the final design project.

Students will submit a detailed proposal on their topic of interest. The proposal will focus on the development of a product design/ building form/ developing interfaces between modeling and machining or between two graphic modeling tools/ building automation/ developing intelligent building controls. The project will be oriented towards developing prototypes and theoretical issues could be exhausted in the dissertation section. The Proposal has to be approved by the committee and the supervisor. There would be periodic reviews of the project. The final presentation will focus at developing and demonstrating a prototype.

TOTAL: 330 PERIODS**OUTCOME:**

- The student will be competent to define creative problems within his/her field of design, including research and synthesis of technical, aesthetic, and conceptual knowledge.

DG7001

BUILDING MANAGEMENT AND CONTROL SYSTEMSL T P/S C
3 0 0 3**OBJECTIVES:**

- This course provides a detailed exposure to students regarding the design & application in the field of life safety, electronic security & services automation requirements.
- To expose the students to the mandatory and inevitable integration of building management systems in building construction..

UNIT I SAFETY SYSTEMS – FIRE ALARM & PUBLIC ADDRESS SYSTEM 9

Objective of a Fire Alarm System, essential components of a Fire Alarm System, Type of detection technology currently in use and Statutory Standards to be followed in design. Explanation of the essential Clauses of the the codes, and various types of Technologies employed in the Fire Alarm System, basic knowledge on how a Fire Alarm system works, designed and installed.

Objective of a Public Address System, essential components of a Public Address System, various types of technologies currently in use and design guidelines to be followed and basic knowledge on how a Public Address System works, is designed and installed

UNIT II SAFETY SYSTEMS – FIRE SUPPRESSION SYSTEM 9

Objective of a Fire Suppression System, Explanation on Fire triangle, Essential Components of a Fire Suppression System, different type of Fire Suppression Systems, detailed design criteria for Hand held extinguishers Wet Riser, Sprinkler Systems and various gas Based Fire Suppression System, and Type of Statutory Standards followed in Suppression, Explanation on the essential Clauses and Basic Knowledge on how a Fire Suppression System works, is designed and installed.

UNIT III SECURITY SYSTEMS – ACCESS CONTROL SYSTEM AND INTRUDER ALARM SYSTEM 9

Introduction to Access Control, Intruder Alarm, Essential Components of each System, and Various types of Technologies employed in the system, Basic knowledge as how they work, are designed and installed.

UNIT IV SECURITY SYSTEMS – CCTV AND PERIMETER PROTECTION 6

Introduction to CCTV, Perimeter protection system, Essential Components of each System, and Various types of Technologies employed in the system, Basic knowledge as how they work, are designed and installed.

UNIT V INTEGRATED BUILDING MANAGEMENT SYSTEM 12

The objective of the Integrated Building Management System (IBMS), the list of utility, safety & security systems that are generally monitored & controlled through IBMS, the various components of IBMS, types of integration with the utility, Safety & security systems, explanation in detail on how each utility, safety & security system is integrated to IBMS, details of various parameters that can be monitored & controlled on each utility, safety & security system and the basic knowledge on how they work, are designed and installed.

TOTAL: 45 PERIODS

OUTCOME:

- To ensure that every architect understands & designs the buildings that facilitates safe, code compliant, secure & comfortable buildings for the occupants

REFERENCES:

1. Building Automation Systems – A Practical Guide to Selection and Implementation, Maurice Eyke
2. The Principles and Practice of Closed Circuit Television, Mike Constant & Peter Turnbull
3. Rules for Automatic sprinkler Installation – second edition – Pub: Tariff Advisory Committee.
4. CCTV Surveillance, Herman Kruegle.
5. National Building Code of India 2005 (Part IV)
6. Bureau of Indian Standards IS2189, IS2190, IS15105, IS13039.
7. Fire Suppression Detection System, John L. Bryan.
8. Security Systems and Intruder Alarm System, Vivian Capel.

**DG7002 DIGITAL COMMUNICATION AND MULTIMEDIA IN DESIGN L T P/S C
0 0 6 3**

OBJECTIVE:

- Objective of this course is to introduce various aspects of multimedia technologies and familiarize them with the practical and theoretical issues.

UNIT I 24

Introduction: Overview, building blocks, standards, multimedia and internet, applications, Data representation, transmission, modes of data transmission, encoding frequency spectrum, transmission channel, synchronous and asynchronous communication systems.

UNIT II 18

Audio: Use of audio in computer applications, Video /Image: Analogue and Digital video image basic concepts, capture, digital representation of sound, video and processing.

UNIT III 24

Using animated textures Real world vs. virtual lighting principles Composing the frame Presentation techniques

UNIT IV 12

Text and Animation: Text in multimedia, hypertext, hypermedia, Principle of animation, 2D, 3D animation

UNIT V 12

Animation principles, Post production techniques with adobe Photoshop and Adobe Premiere

TOTAL: 90 PERIODS

OUTCOME:

- Students will learn how smart materials can influence creative ideas, solutions and innovation in design
- Students will learn representational strategies through rendering.
- Students will learn for drawing, editing, and vector manipulation, for post-production.

REFERENCES

1. Ralf Stainntetz, Katra Nahrstedt, Multimedia Computing, communications and application, Pearson Education Services.
2. Roy a Plastock, Gorden Kalley: Computer Graphics, McGraw Hill
3. John I Koegel Buford: Multimedia system, ACM Press 2000
4. J. D. Foley, A. Van Dam: "Fundamental of Interactive Computer Graphics", Addition Wesley year, addition.
5. 3ds Max 2010 Architectural Visualization (advance to expert) - Brian L. Smith
6. 3ds Max 2009 Architectural Visualization (Intermediate to Advanced) - Brian L. Smith
7. The Bare Bones Camera Course for Film and Video – Tom Shroepel

Useful Websites

<http://area.autodesk.com/>
<http://www.3dcafe.com/>
<http://www.thegnomonworkshop.com>
<http://www.3dworldmag.com/>

DG7003

HIGH END 3D MODELLING

L T P/S C
2 0 2 3

OBJECTIVE:

- To allow the students to comprehend and prepare Digital design solution using advance high end modeling and animation.

This course will train students on the high end-3D modeling and animation. This course would Specifically focus on MAYA - The state of art modeling software. The training will look at the following sections HypergraphModeling: Nurb Modeling/ Polygon Modeling / Organic Modeling Animation: Working with Key frames and Breakdowns/ Deformers/ Character setup/Rendering: Lighting/ Shading/ Texture Advanced Effects and MEL Scripting Language.

TOTAL: 60 PERIODS

OUTCOME:

- The student will be able to Identify the basic elements in the process of creating a 3D scene and construct 3D models using well proven techniques;

REFERENCES:

1. Users Manual for MAYA, Alias Wavefront.
2. Perry Hrovos, et.al, MAYA Complete 2, BPB Publications New Delhi, 2000.

DG7004

INTRODUCTION TO SCRIPTING

L T P/S C
2 0 2 3

OBJECTIVES:

- To deepen the understanding of a range of programming languages and its features.
- To convey the idea of scripting language as a medium between software and create a large systems.

UNIT I INTRODUCTION TO SCRIPTING

2

Definition and purpose of scripting – Introduction to programming language and software used for scripting.

UNIT II BASICS OF JAVA

23

Introduction to Java – Basic Object Oriented Programming – Advanced Object Oriented Programming – Basic Java Syntax – Java Input/Output – Applets and Basic Graphics – Mouse and Keyboard Events – AWT Components – Layout Managers – Java 2D.

UNIT III JAVA APPLICATIONS AND APPLETS 10
 Basic Swing – Advanced Swing and MVC – Multithreaded Programming –
 Multithreaded Programming – Network Programming clients/severs.

UNIT IV DIRECTOR 15
 Director Basics – Element of Animation – Time line – Simple presentation using Director

UNIT V DIRECTOR LINGO 10
 Introduction to Interactive Anatomy of Lingo – Element of Scripting - Building Interactive Movie –
 Working with Multiple Movie and Casts – MIAW - Scripting with Net savvy Lingo – Lingo and
 Lists – Lingo and Audio Video – Xtras

TOTAL: 60 PERIODS

OUTCOME:

- To develop student’s concern of the role of different programming paradigms in configuring /managing system.

REFERENCES:

1. The Java Class Libraries, Volume 1& Volume 2by Patrick Chan, Rosanna Lee, Douglas Kramer
2. JavaScript: The Definitive Guide by David Flanagan
3. Java Software Solutions by John Lewis, William Loftus
4. Director 7 and Lingo Bible by Robert Martin, John R. Nyquist, Jonathan P. Bacon

DG7005

SMART MATERIALS

L T P/S C
3 0 0 3

OBJECTIVES

- To introduce students to smart materials for use in architectural design – materials and products that have changeable properties and that are able to reversibly change their shape or colour in response to physical elements like light, temperature etc
- To examine, in depth, materials and technologies such as LED’s, smart glazing, displays and interactive surfaces and their contemporary application in architecture.
- To discuss the methods of fabrication, production and construction for innovation in design.

UNIT I 6
 Introduction - Innovative Materials – Smart materials in Nature – Current Trends and Developments

UNIT II 10
 Property Changing Smart Materials Photochromics,-Thermochromics- Electrochromics – Photoadhesives- Electroactive Polymers- Shape Memory Alloys

UNIT III 10
 Energy-exchanging smart materials
 Phase change Materials (PCM) - Photoluminescents – Photovoltaics, LED’s, Photoelectric-thermoelectric-Piezoelectric

UNIT IV 10
 Matter-exchanging smart materials
 Gas/Water storing Smart Materials - Absorbent/Super absorbent Polymers- Bioplastics

UNIT V 9
 Case Studies by Students on the innovative applications of Smart Materials in Design

TOTAL: 45 PERIODS

OUTCOMES:

- Students will learn the fundamentals of material and comprehensively analyze current applications in architecture.
- Students will learn and explore the potential of smart materials in creative designing.
- Students will focus on the smart material characteristics and explore different methods of material technology transfer to design, thereby inventing innovative approaches to design.

REFERENCES

1. Michelle Addington and Daniel L.Schodek, *Smart Materials and Technologies in Architecture*, Architectural Press, Elsevier, 2004
2. Axel Ritter, *Smart Materials: In Architecture, Interior Architecture and Design*, Birkhauser, 2007
3. Marinella Ferrara and Murat Bengisu, *Materials that Change Color: Smart Materials, Intelligent Design*, Springer, 2013
4. Elena Gorb, Yves.J.M.Brechet et al, *Materials Design Inspired by Nature: Function Through Inner Architecture (RSC Smart Materials)*, RSC Publishing, 2013

DG7006

VIRTUAL SOCIETY

L T P/S C
3 0 0 3

OBJECTIVE:

- To sensitize the student on the evolution, aspects and characteristics of Virtually Society and its role in Digital architecture in graphic representation and visualizing social structures etc.

UNIT I CULTURAL BASIS 6

Social visualisation through readings, drawn from sociology / Psychology and interface design.

UNIT II ISSUES OF REPRESENTATIONS IDENTITY AND EXPRESSION 12

Meaning through association - subjective - transitory - cross cultural meanings ascribed to an object / Cultural phenomena in virtual objects: nature of identity in an immaterial and intangible environment / Issues of identity deception

UNIT III COMMODIFICATION, COMMERCE AND FASHION 6

Globalization, e-com and marketing- Fashion, identity and marketing- Machines as part of fashion - Role of Fashion and status in the virtual world.

UNIT IV COMMUNICATION AND PEDAGOGY 12

Virtual education and issues of Commodification/ virtual classrooms/ universities Virtual organisational existence / Society of Audience / online social world / Chat rooms / news groups and mailing lists

UNIT V CITY AND ONLINE WORLD 9

City as a metaphor for online world/ city as a hub of information/ place of strange fears/crime and doubtful morality/surveillance and security

TOTAL: 45 PERIODS

OUTCOME:

- The students develop an insight into virtual society for students to know, interact and visualize through specific social media in order to pursue mutual interests or goals.

REFERENCES:

1. Nicholas Negroponte, *Being Digital*. 1995
2. Michael Benedikt (ed.), *Cyberspace: The First Steps*, MIT Press, Cambridge, 1991
3. G. Steven Jones, *Cyber society: Computer-mediated Communication and Community*. 1995
4. Jon Dovey, et.al, *Fractal dreams: New media in social context*. Sage Publications, 1996
5. McCracken. *Culture and Consumption*.
6. Judith Donath. *Identity and Deception in the Virtual Community*

OBJECTIVES:

The main intent for this course is to introduce students to contemporary digital tools in order to further their skills, allowing them to better design and communicate architectural concepts or ideas fluidly and eloquently.

UNIT I INTRODUCTION TO WEB DESIGN**15**

Basics of web design – Introduction to software used for web design – ADOBE IMAGE READY, DREAMWEAVER, FLASH etc.

UNIT II STATIC PAGES**15**

Slice – URL in ADOBE IMAGEREADY. Creation and Editing of site map – layer, tables, frameset, - CSS style – Forms – tools like insert, roll over etc., in DREAMWEAVER

UNIT III ANIMATION IN FLASH**15**

Introduction to MACROMEDIA FLASH, importing other file formats to Flash- saving and exporting Flash files, Frame by frame animation – Motion Tweening – Shape Tweening

UNIT IV INTRODUCTION TO SCRIPTING**15**

Using Timeline – Frames –Key frames- Creating and using Symbols- Simple scripting in flash – Publishing SWF files

UNIT V DEVELOPING A WEB SITE**15**

Using the skills and concepts learnt with the ADOBE IMAGEREADY, DREAMWEAVER, and FLASH software. Students will develop their portfolio in the form of web pages. These pages have to be uploaded in free public domains.

TOTAL: 75 PERIODS**OUTCOMES:**

- To ensure that every architect understands & designs the buildings that facilitates safe, code compliant, secure & comfortable buildings for the occupants
- To ensure that every architect understands and develop a web site using the multiple platforms.

REFERENCES:

1. Flash Web Design, the Art of Motion Graph, Curtis Hillman, New Riders Publishing, Indianapolis, IN. U.S.A, 2000
2. M.E. Morris, and R.J. Hinrichs, Web Page Design, Prentice Hall, 1996.
3. Mark Von Wodtke, Mind over Media: Creative Thinking Skills for Electronic Media, McGraw-hill, New York, 1993
4. Adobe Photoshop CS2, Flash CS3 professional on demand by Steve Johnson, Andy Anderson, Persecution inc, 2012.