

SAVITRIBAI PHULE PUNE UNIVERSITY
(FORMERLY UNIVERSITY OF PUNE)



SYLLABUS FOR

MASTERS IN ARCHITECTURE

M. ARCH (DIGITAL ARCHITECTURE)

(To be implemented w.e.f. A.Y. 2019-20)

BOARD OF STUDIES IN ARCHITECTURE
FACULTY OF SCIENCE AND TECHNOLOGY

PREAMBLE

Digital technologies with its applications have been a catalyst in changing the way we live and aspire and have significantly changed the way architecture is practiced and produced. The focus of the curriculum is to prepare architectural academics for future aspirations. The intent is to reconfigure learning patterns that are inspired by a desire to harness increasingly sophisticated digital technologies in architectural design and construction.

Digital architecture covers the entire gamut of digital tools, software's and technologies as and when they are applied to architectural design and execution process and thus relates to the entire span of the built environment based on digital technologies ranging from analysis, mapping to computational design, services, information modelling and construction management.

At the heart of the curriculum are the parametric design processes that are used for generation of different formal expressions of a design concept. The term parametric design implies the representation of a design with a series of associative operations, controlled by constraints and parameters. These are defined in parametric software's that are able to generate interactive forms in the three dimensional (3D) space. The realization of such designs is facilitated by CAM processes essentially known as digital fabrication. With the use of parametric design tools, students/practitioners can study the interactive relationships of architectural designs in the early steps. By enabling the enlarged set of performances assessed impact choices at an early stage, parametric tools enhance interdisciplinarity, and creates a visual link between form and numeric performance evaluations, which in turn reduce the investment in poor performing solutions. Furthermore, they can revise basic aspects of the actual construction, including material, manufacturing technologies and structural components. This understanding and formulation of a procedural symbiotic relationship between conception, generation, and production is the crux of the digital architecture curriculum. The gamut of functional and formal knowledge includes parametric design methodologies, digital fabrication, parametric process theories, parametric software proficiencies, Interactive architecture through embedded systems, parametric urbanism as its core intent and are supported by a variety of subjects like, analytical diagramming and parametric thinking, evolutionary processes and morphogenetic strategies, performance based studies through analysis software's, parametric urbanism and research methodologies. Experimental leanings in the field are explored through subjects like digital tectonics and materiality, parametric processes in allied fields, generative urbanism and responsive design in the form of electives.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)-

1. **THEORETICAL BASE** – To inquire into the varied nature and practice of computation in architectural design, and the ways in which design meaning, intentions, and knowledge are constructed through parametric thinking, representing, sensing, and making. They focus on the development of innovative computational tools, processes, and theories, and their application
2. **KNOWLEDGE AND SKILLS** - to enhance skills wrt creative design of an advanced level interactive built environments that pursues transformation of conceptual design to production documentation and manufacturing of built environments using contemporary digital mediums
3. **RESEARCH** - To encourage students to enhance understanding of a specific field of interest, and to initiate them towards experimental leanings in the field of Digital architecture and fabrication practice
4. **EXTENSION & COLLABORATION** -To expose the students to the prevalence of collaborative platforms in the field of Parametric architecture and digital research and to allow them to test their skills of digital design and production by venturing in any allied field of practice /research

PROGRAM OUTCOMES (PO)

1. **PARAMETRIC KNOWLEDGE BASE** – Ability to understand concepts and skills for architectural geometry construction using parametric modelling processes and having knowledge of theoretical framework towards development of contemporary parametric modelling processes for customizing generative design systems
2. **PARAMETRIC SKILL BASE** - Proficiency in digital design and fabrication towards the creative design of an advanced level interactive built environments
3. **TECHNICAL AND COMMUNICATION SKILL-** Proficiency in describing various elements of architectural design as sets of parameters which are then expressed as numeric and geometric relationships. Develop ability to communicate parametric process and design through graphical technical and communication skills.
4. **CONTINUING PROFESSIONAL DEVELOPMENT-** To be able to expand the acquired proficiency in parametric processes or to develop the area of study so that it contributes to contemporary architectural practice
5. **DIVERSITY & EXPOSURE TO A MULTIDISCIPLINARY ENVIRONMENT-** Ability to apply parametric skills to allied design fields and Work in teams on interoperability platforms

Sr No	Program outcomes	Subjects in curriculum
1	Parametric knowledge base	Digital Design Studio I,II&III DA process theories and History-1,II,III
2	Parametric design skills	Parametric Softwares Digital Fabrication I,II&III Analysis Software
3	Technical and communication skill	Analytical diagramming and Architectural Representation Parametric urban mapping Research Methodologies -I
4	Continuing professional development	Practical training Digital Architectural Project Elective III Research Paper
5	Diversity &Extension to a multidisciplinary environment	Elective –I Elective-II

Sr No	Electives	Tentative Subjects for Electives
01	Elective I(Sem I)	Digital Materiality and Tectonics, Performative design, Techniques and Technologies in Morphogenetic Design
02	Elective II (Sem II)	Product design, Furniture Design, Automotive design and styling and Fashion technology.
03	Elective III(Sem IV)	Open Elective –Choice based -interdisciplinary elective

MATRIX OF PROGRAM EDUCATIONAL OBJECTIVES AND PROGRAM OUTCOMES

PEO	P01	P02	P03	P04	P05
PE01 THEORETICAL BASE	√	√			
PE02 KNOWLEDGE AND SKILLS	√	√	√	√	√
PE03 RESEARCH -	√		√	√	√
PE04 EXTENSION/ COLLABORATION		√	√		√

SEMESTER I M.Arch Digital Architecture

Course Code	Course Title	Course Type	Contact periods (60 mins)	Teaching Scheme			Examination scheme				
				Th/wk	Stu/wk	Credits	SS	SV	Theory		Marks
									In sem	End Sem	
2019D A101	Digital Design Studio I	C1	10	2	8	10	-	400	Nil	Nil	400
2019D A102	Elective –I	EL	3	1	2	3	100	Nil	Nil	Nil	100
2019D A103	Parametric Softwares	C2	4	1	3	4	200	Nil	Nil	Nil	200
2019D A104	DA Process theories and History-1	SP1	3	2	1	3	Nil	Nil	30	70	100
2019D A105	Digital Fabrication I	Sp2	3	1	2	3	Nil	Nil	30	70	100
2019D A106	Analytical diagramming and Architectural Representation	L	2	1	1	2	100	Nil	Nil	Nil	100
			25	8	17	25					1000

SEMESTER II M.Arch Digital Architecture

Course Code	Course Title	Course Type	Contact periods (60 mins)	Teaching Scheme			Examination scheme				
				Th/wk	Stu/wk	Credits	SS	SV	Theory		Mark s
									In sem	End Sem	
2019DA 201	Digital Design Studio II	C1	10	2	8	10	-	400	Nil	Nil	400
2019DA 202	Elective –II	EL	3	1	2	3	100	Nil	Nil	Nil	100
2019DA 203	Digital Fabrication II	C2	4	1	3	4	200	Nil	Nil	Nil	200
2019DA 204	DA process theories and History-II	SP1	3	2	1	3	Nil	Nil	30	70	100
2019DA 205	Research I	SP2	3	2	1	3	Nil	Nil	30	70	100
2019DA 206	Analysis Softwares	L	2	1	1	2	100	Nil	Nil	Nil	100
			25	9	16	25					1000

SEMESTER III M.Arch Digital Architecture

Course	Course Title	Course Type	Contact periods (60 mins)	Teaching Scheme			Examination scheme				
				Th/wk	Stu/wk	Credits	SS	SV	Theory		Marks
									In sem	End Sem	
2019DA 301	Digital Design Studio II	C	10	2	8	10	-	400	Nil	Nil	400
2019DA 302	Research II	C	3	1	2	3	100	Nil	Nil	Nil	100
2019DA 303	Practical Training	C	4	1	3	4	-	200	Nil	Nil	200
2019DA 304	DA process theories and History-III	SP1	3	2	1	3	Nil	Nil	30	70	100
2019DA 305	Digital Fabrication III	SP2	3	1	2	3	Nil	Nil	30	70	100
2019DA 306	Parametric Urban mapping	L	2	1	1	2	100	Nil	Nil	Nil	100
			25	8	17	25					1000

This includes Professional Training (40 full working days) to be undertaken during intermediate time between II & III Semester, details of which are mentioned in the detailed syllabus. The Oral Assessment of the same will be held at the end of Semester III. The subject is included as core subject and will have both sessional and viva assessment.

SEMESTER IV M.Arch Digital Architecture

Course Code	Course Title	Course Type	Contact periods (60 mins)	Teaching Scheme			Examination scheme				
				Th/wk	Stu/wk	Credits	SS	SV	Theory		Mark s
									In sem	End Sem	
2019DA401	Project	C	20	4	16	20	-	800	Nil	Nil	800
2019DA402	Elective III*	EL	5	1	4	5	200	Nil	Nil	Nil	200
			25	5	20	25					1000

*Elective III can be offered as an open elective. In case it is not possible to offer open elective colleges should offer any elective from the list of electives which the student has not undertaken in any previous semester.

F.Y M. Arch Digital Architecture

Semester I

SUBJECT TITLE: DIGITAL DESIGN STUDIO-I				
Subject Code : 2019DA101				
Teaching Scheme		Examination Scheme	Marks	
Theory Periods per week	2	Sessional	300	
Studio Periods per week	8	Viva/Oral	100	
Total Contact Periods (60 min period) per week	10	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	10	Total Marks	400	

Course Objective: - To explore the inter-relationships between the contemporary mediums of digital design to digital production

Course Content:-

The studio will focus on parametric design process that demonstrates link between performative designs, solid modelling and computer numerically controlled fabrication explored at a scale of an installation/product

Unit I -Through the study of a wide range of complex built architectural study-cases, the student is introduced to generative modelling control and analysis.

Unit II-The work is focused on the generation of the building system by understanding the geometric dependencies and its constructive constraints like human ergonomics, explicit site information, materiality, specific programmatic data and materiality

Unit III- Analogue modelling and advanced digital fabrication tools would be engaged to test the performative capabilities of one specific selection generated through the iterative process.

Submission requirement for Sessional Work

Students will produce the work in the following form;-

Complete documentation with all necessary design abstracts, process trajectory, digital models, diagrams, drawings, illustrations & text in a printed format as well as a soft digital scaled model/full scale analogue model of the complete project as deemed necessary by the design brief

Course Outcome

Students apply the knowledge and parametric design skills learnt in the course modules into the creative design of an installation/product

Readings:-

1. Burry, Mark.(2013) *Scripting Cultures* :Architecture design and programming, John Wiley & Sons Ltd
2. Menges A, Alquist, S. *Computational Design Thinking : Computation Design Thinking*, John Wiley & Sons Ltd
3. Casey, R., Chandler, McWilliams(2010). *Form+Code in Design, Art, and Architecture*. Princeton architectural press
4. Terzidis,K.(2006) *Algorithmic Architecture*. Architectural Press,
5. Wentworth,D.(1917) *On growth and form*. Cambridge University Press
6. Frazer,J.(1995). *Evolutionary architecture*. AA London

SUBJECT TITLE:				
ELECTIVE –I				
Subject Code : 2019 DA 102				
Teaching Scheme		Examination Scheme	Marks	
Theory Periods per week	2	Sessional	100	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	3	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	3	Total Marks	100	

Course Objective

The objective of this elective course is to allow the students to cover a varied spectrum of domains of investigation within the premise of digital architecture. This course seeks to posit the role of different experimental threads within the broader context of digital practice.

Course Content

With the aim of imparting core theoretical literacy in different experimental leanings of digital architecture electives are offered in the disciplines of **Digital Materiality and Tectonics, Performative design and Techniques and Technologies in Morphogenetic Design**

The choice of the electives to be offered to the students will depend upon each individual College and the availability of resource persons. In such a case detailed syllabus for all other Elective Topics will be finalized by individual College in consultation with expert Faculty, considering the time and marks allotted to the subject.

Digital Materiality and Tectonics :-

The subject investigates material-based design in research and practice, conceptual models processes and principles will be identified and documented.

Performative design:-

This elective course will investigate the theoretical basis for understanding the current shift in performance-based design that stresses upon the role of associative geometry for performance driven architecture will be studied in detail

Techniques and Technologies in Morphogenetic Design

Digital morphogenesis as a process of shape development enabled by computation is investigated through formal theoretical research. Investigations of a group of methods that employ digital media for form-making and adaptation rather than for representation, often to respond to contextual processes will be studied through case studies.

Submission requirement for Sessional Work

Assignment will be in the form of in depth documentation subsequent to the study of a topic related to any one of the subject based on availability of experts, which will be presented by the student in the form of a documented report , and a presentation on the same.

Course Outcome

The students will gain exposure to different experimental threads within the broader context of digital practice.

Readings:-

1. Menges,A(2012). *Emergence: Morphogenetic Design Strategies* .John Wiley and sons
2. Kolarevic,B.(2005) *Performative Architecture: Beyond Instrumentality*. Routledge
3. Corser,R.(2010). *Fabricating Architecture: Selected Readings in Digital Design and Manufacturing*. Princeton Architectural Press
4. Mori,T(2005). *Textile/Tectonic: Architecture, Material, and Fabrication*. George Braziller
5. Menges,A. *Material Synthesis: Fusing the Physical and the Computational*. Jhon Wiley and Sons

SUBJECT TITLE:				
PARAMETRIC SOFTWARES				
Subject Code : 2019 DA 103				
Teaching Scheme		Examination Scheme	Marks	
Theory Periods per week	1	Sessional	200	
Studio Periods per week	3	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	4	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	4	Total Marks	200	

Course Objective

The subject aims to introduce students to associative parametric design software, both as an aid to an iterative design process, a method of design exploration through the introduction of parametric modeling softwares.

Course content

Unit I - Associative modelling as one of the approach for design development. Demonstrating the significantly associative role of the software as against its assumed role as a representative tool.

Unit II - The subject will become the base to develop digital concepts through parametric skill sets.

Unit III -Students will be introduced to different exercises to familiarize thoroughly with the parametric software fundamentals which help them in precision modelling and to create and edit free-form 3d models.

Submission requirement of Sessional work

Specific software submissions in the form of process tutorial output will be submitted individually by every student.

Course Outcome

Students will be able to develop their parametric understanding and demonstrate them through grasshopper codes

Readings

1. Woodbury,R. *Parametric; Design for Architecture* Routledge,NewYork
2. Tedeschi,A.(2014) *.Algorithmic aided design* . Le Penseur
3. Payne,A.(2010), *The Grasshopper Primer_Second Edition*. Modelab & Gitbook
4. Khabazi,Z(2012). *Generative Algorithms series with grasshopper*. Morphogenesis
5. Issa,R. *Essential modelling and mathematics*. Robert Mc Neel and Associates
6. Freyer C.Sebastian,N,Rucki,E. *Digital By Design : Crafting Technology For Products And Environments*.Thames Hudson
7. Schulitz, H C.(2010) *Form Follows Performance*. Birkhäuser Architecture

SUBJECT TITLE:				
DA PROCESS THEORIES AND HISTORY I				
Subject Code : 2019 DA 104				
Teaching Scheme		Examination Scheme	Marks	Duration
Theory Periods per week	2	Sessional	Nil	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	3	In-semester Examination	30	
		End-semester Examination	70	150 min
Total Credits	3	Total Marks	100	

Course Objective:-

To develop a conceptual orientation for the historical development of digital architecture analyzed as a product of social, cultural, religious and political forces

Course Content:-

The focus of the content will be on Readings and discussions that trace the historical development of past 20 years that was crucial for the formation of Digital Culture in architecture

Unit I -Sociocultural and technological ferment of Post modernism and DE Constructivist movement

Unit II -Advancement in technical capabilities brought about a radical departure from traditional planning in architecture.

Unit III- Process based theoretical investigations through works of practitioners to understand their radical intent and parametric process trajectories

Submission requirement for sessional work:

Submission will be in the form of reports, discussions and debates. The outcome will also be in the form of individual perceptions on process theories through documentation and critical appraisals.

Course outcome

The student will be able understand the development of digital architecture as a product of social, cultural, religious and political forces and will be able to posit/critically appraise a process theory wrt a project

Readings:-

1. Picon,A(2010) ; *Digital Culture in Architecture* . Birkhäuser Architecture
2. Rahim,A.(2000) *Contemporary Processes in Architecture* . Academy Press
3. Kolarevic,B.(2005); *Architecture in the Digital Age: Design and Manufacturing* . Taylor & Francis
4. Oxman,Rivika & Oxman.Robert(2000).*Theories of the Digital in Architecture*. Academy Press
5. Spuybroek,L. (2004) *NOX - Machining Architecture* .Thames & Hudson
6. Burry,M.Burry,J.(2012) *The new mathematics of architecture*. Thames & Hudson
7. Bonet,J.Armengol,I.Tomlow,J.Burry,M. *Antoni Gaudi; Gaudi Unseen* .Jovis
8. Frazer,J. *Evolutionary architecture*. AA London

SUBJECT TITLE:				
DIGITAL FABRICATION I				
Subject Code : 2019 DA 105				
Teaching Scheme		Examination Scheme	Marks	Duration
Theory Periods per week	2	Sessional	Nil	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	3	In-semester Examination	30	
		End-semester Examination	70	150 min
Total Credits	3	Total Marks	100	

Course Objective: -

The primary learning objective of this subject is learning manufacturing workflows and technologies of materialization such as conventional fabrication protocols as well as rapid prototyping and numerically controlled manufacturing.

Course content:-

Different manufacturing processes like Additive, Subtractive & Consolidatory processes will be introduced to the students as under

Unit I- Study of various industrial mass production systems

Unit II- CNC cutting and milling (for mass customization)

Unit III- Laser Cutting

Unit IV- 3D Printing (SLS & FDM) & 3D Scanning

Unit V - 3Axis CNC cutting & milling on non-planar surfaces

Submission requirement for Sessional work:-

Students will demonstrate their proficiency through Model making Students will submit reports related to their process of fabrication and research in the related domain will be presented through documentation.

Course outcome

Students will be able to understand the difference between mass production systems and the ability to use CNC machinery for mass customization

They will also acquire proficiency in Digital fabrication operations

Readings:-

1. Iwamoto, I. (2009) *Digital Fabrications: Architectural and Material Techniques* Princeton architectural Press
2. Caneparo, L. *Digital Fabrication in Architecture, Engineering and Construction*. Springer Netherlands
3. Breorkram, C. (2017) *Material Strategies in Digital Fabrication* Routledge
4. Kolarevic, B. (2008) *Manufacturing Material Effects : Rethinking Design And Making In Architecture*. Routledge
5. Peters, S. (2010) *Material Revolution : Sustainable And Multi Purpose Materials For Design And Architecture*. Birkhäuser Architecture
6. Borden, G P . *Matter : Material Processes In Architectural Production*. Routledge
7. Lindsey, B. (2001) *Digital Gehry : Material Resistance Digital Construction*. Birkhäuser Basel

SUBJECT TITLE:				
ANALYTICAL DIAGRAMMING AND ARCHITECTURAL REPRESENTATION				
Subject Code : 2019 DA 106				
Teaching Scheme		Examination Scheme	Marks	
Theory Periods per week	1	Sessional	100	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	2	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	2	Total Marks	100	

Course Objective: - To understand the potential of diagramming as an analytical as well as a representational tool inherent to parametric design process

Course Contents:

Unit I- Understanding diagramming as an analytical and representational tool

Unit II- The history and evolution of diagramming in architecture

Unit III- Developing the ability to sieve information and build effective information diagrams

Unit IV- Exploring the usage of diagramming in professional international practices

Unit V - Use of program diagrams in the design process & architectural representation techniques

Unit VI- Introduction to Architectural representation platforms & Post-production techniques and tools

Submission requirement for Sessional Work

Assignment will be in the form of notes/ assignments covering all the topics mentioned above with suitable examples, sketches and supportive material. Details of the project relating to all the above mentioned topics will be submitted in the form of report and /or presentation.

Course outcome

The student will be able to conceptually evolve a design strategy through diagramming and will be able to present layered information through infographics

Readings

1. Lankow, Jason (2012), *Infographics: The Power of Visual Storytelling*, Wiley & Sons Hoboken

2. McCandless; David (2014), *Knowledge is Beautiful*. Harper Collins
3. Mau, Bruce and Koolhaas; Rem (1998), *S,M,L,XL*, The Monacelli Press
4. MVRDV (1999). *Metacity/Datatown* .MVRDV/010 Publishers
5. Koolhaas. R (1999).*Content*. TASCHEN
6. Tschumi, B. (2014). *Notations: Diagrams and Sequences*. Bernard Tschumi
7. Ingells, Bjarke (2009); *Yes Is More*. BIG ApS
8. Steele J. (2002). *Architecture And Computers : Action And Reaction In The Digital Design Revolution*. Watson-Guptill Publications
9. Padgham,L. Winikoff;M. *Developing Intelligent Agent Systems : A Practical Guide*. Wiley London
10. Young P M.(2011) ; *Conceptual Representations : Architectural Diagrams1*. DOM Publishers
11. Young P M (2011); *Conceptual Representations : Architectural Diagrams2*. DOM Publishers

F.Y M. Arch Digital Architecture

Semester II

SUBJECT TITLE: DIGITAL DESIGN STUDIO-II				
Subject Code : 2019DA201				
Teaching Scheme		Examination Scheme	Marks	
Theory Periods per week	2	Sessional	300	
Studio Periods per week	8	Viva/Oral	100	
Total Contact Periods (60 min period) per week	10	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	10	Total Marks	400	

Course Objective:

This unit of study introduces explorative and creative thinking expressed through the application of digital software to design propositions. Students will develop the ability to use digital software for the development and execution of parametrically designed building typology

Course content:

Unit I- Decoding the architectural design process as a collaborative, iterative and evolutionary vector framework

Unit II- Identifying and defining the role of parametric platforms as a powerful design tool that augments the design and execution process

Unit III- Develop and document individual visual communication concepts and outcomes framed by a project brief

Unit IV- Identify and use appropriate digital software to execute intended design outcomes

Unit V Produce creative design outcomes in a digital environment with reference to appropriate parametric software use for designing a building typology

Sessional Work

Students will work on above mentioned in detail and will submit the work in the form of drawings and/ models and supplementary documentation as found suitable to explain the design process and product judiciously.

Course Outcome

Students will develop the ability to apply the skill of associative parametric modelling for the design and development of parametrically designed building typology

Readings

1. Koolhaas, R. *Delirious New York: A Retroactive Manifesto for Manhattan*, The Monacelli Press
2. Fenton, J. *Pamphlet Architecture 11: Hybrid Buildings*. Princeton Architectural Press
3. Woodbury, R. *Elements of Parametric Design*. Routledge New York
4. Tschumi, B. (1994, 2000, 2005, and 2010) *Event Cities I* MIT Press,
5. Barios, C. *Parametric Design in Architecture: Fundamentals, Methods, Applications* Birkhauser Architecture
6. Maas, W. (2013) *MVRDV: FARMAX* nai010 publishers

SUBJECT TITLE:				
ELECTIVE –II				
Subject Code : 2019 DA 202				
Teaching Scheme		Examination Scheme	Marks	
Theory Periods per week	2	Sessional	100	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	3	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	3	Total Marks	100	

Objective:

To introduce the students to parametric developments in allied fields and to observe adjacencies in the use of parametric tools.

Course content:

Unit I- Allied fields of designing along with their design agencies will be investigated. The focus will be on the design variables, constraints and other related key parameters within the design premise and subsequent negotiations by the design agency.

Unit II- The allied electives will be offered in the field of Product design, Furniture Design, Automotive design and styling and Fashion technology.

The choice of the electives to be offered to the students will depend upon each individual College and the availability of resource persons. In such a case detailed syllabus for all other Elective Topics will be finalized by individual College in consultation with expert Faculty, considering the time and marks allotted to the subject.

SESSIONAL WORK:

The students will be asked to make presentations about the role of parametric tool in the particular field of design introduced to them. Through small exercises the students will apply their parametric knowledge to the design process specific to the chosen field through which a final design will be achieved.

Course outcome

The students will learn the use of parametric tools for allied design and its importance in collaborative design process

Readings:-

1. Rosetti,E. *Designing Jewelry with Rhinoceros* Lulu publishing services
2. Buscaglia,D. *Designing jewellery with Rhino 5.0*. Lulu publishing services
3. Miyake, I.(1999) *Making Things*. Fondation Cartier pour l'art contemporain
4. Midori Kitamura; *Issey Miyake Pleats Please*. Taschen, 2012
5. Kan Hu,Chi Di; *Addendum Surface Design Based on the Parametric Method*. Springer Berlin Heidelberg
6. Jackson,P. *Folding Techniques For Designers : From Sheet to Form* Laurence King Publishing
7. Freyer, C. *Digital By Design : Crafting Technology For Products And Environments*. Thames & Hudson
8. Taylor,M.(2003) *Surface Consciousness*. Academy Press

SUBJECT TITLE:				
DIGITAL FABRICATION II				
Subject Code : 2019 DA 203				
Teaching Scheme		Examination Scheme	Marks	
Theory Periods per week	1	Sessional	200	
Studio Periods per week	3	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	4	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	4	Total Marks	200	

Course Objective:-

To augment the Contemporary developments in the building & construction domain which display capacities to facilitate experimentation & investigation in material informed design

The focus is to explore several intrinsic properties of materials, which can prove beneficial for iterative design developments.

Course Content:-

Unit I -Experimentation & investigation into a chosen building material wherein in-depth study of the material & its intrinsic properties are studied and recorded

Unit II- These documented material properties and its behavior are extracted into numerical parameters which are later used to perform iterative digital operations.

Unit III- A feed-back loop thus established between the digital &analogue experiments is further used to augment design developments based on specific properties & behaviors of the materials that are investigated during the course of the studio.

Sessional Work

The sessional work will include and in depth documentation submitted in report form and models

Course objective

Students will gain knowledge in material informed design and will be able to explore different fabrication processes to construct in the researched material

Readings

1. Caneparo,L *Digital Fabrication in Architecture, Engineering and Construction*. Springer Netherlands
2. Iwamoto,I.(2009) *Digital Fabrications: Architectural and Material Techniques*Princeton architectural Press
3. Breorkram,C.(2017) *Material Strategies in Digital Fabrication* Routledge
4. Howey, P. Laughlin,Z. (2012) *Material Matters : New Materials In Design*. Black Dog Pub
5. Bechthold M ; *Innovative Surface Structures : Technologies And Applications*.Taylor & Francis
6. Rei.er, J.Umemota,L, (2006) ; *Atlas Of Novel Tectonics* Princeton architectural press
7. Moussavi, F.Lopez,D. (2009) *Function Of Form* Actar press

SUBJECT TITLE:				
DA PROCESS THEORIES AND HISTORY II				
Subject Code : 2019 DA 204				
Teaching Scheme		Examination Scheme	Marks	Duration
Theory Periods per week	2	Sessional	Nil	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	3	In-semester Examination	30	
		End-semester Examination	70	150 min
Total Credits	3	Total Marks	100	

Course Objective:-

To develop a focused inquiry into a specific area of algorithmic dynamics through formal content and theories with regards to emergent behaviors those exhibit a dynamic interaction of diverse forces.

Course Content:-

Unit I- The subject focuses on the concepts and convergent interdisciplinary effects of evolutionary design processes on design and production technologies in architecture, the focus is on developing these as creative inputs to new architectural design processes.

Unit II- Course content includes theories of Generative algorithms, Emergence, Pattern theory, Genetic algorithm

Unit III- The course is meant to develop vocabulary and critical understanding of a wide array of algorithms, thus developing a critical stance towards algorithmic ‘tooling.’

Unit IV- Research based theoretical investigations will also include works of architects who recursively use algorithmic tooling in their structural form finding and generative design processes.

Submission requirement for sessional work:

The submission will also include research reports and theoretical presentations to explore the systematic investigation in design processes using algorithmic tools.

Course Outcome

The students will be familiar with associated concepts of algorithmic architecture and its application to architectural design research

Readings-

1. Philip, B.(2011) *Shapes: Nature's Patterns: A Tapestry in Three Parts* Oxford University Press

2. Tomoko,S. *From control to Design*. Actar
3. Clegg, C J.(1994) *Advanced Biology Principles And Applications* Hodder Education
4. Ball, P. (2011) *Flow : Nature's Patterns A Tapestry In Three Parts* Oxford University Press
5. Ball, P. (2011) *Branches : Nature's Patterns A Tapestry In Three Parts* Oxford University Press
6. Leach, N. (2004) *Digital Tectonics* . Academy Press
7. Douglis, E.(2014) *Autogenic Structures*. Taylor & Francis,
8. Watanabe, M S. *Induction Design : A Method For Evolutionary Design*. Birkhäuser Basel
9. Kwinter, S.(2003) *Phylogenesis : Foas Ark Foreign Office Architects*. Actar Press

SUBJECT TITLE:				
RESEARCH I				
Subject Code : 2019 DA 205				
Teaching Scheme		Examination Scheme	Marks	Duration
Theory Periods per week	2	Sessional	Nil	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	3	In-semester Examination	30	
		End-semester Examination	70	150 min
Total Credits	3	Total Marks	100	

Objective

To introduce the methods and the process of research within the realm of Digital architecture and to understand the significance of the same in the contemporary architectural practice.

Course contents

Unit I- Introduction to the types of research and the process of formulating a research project

Unit II- Introduction to various methods of research, their relative advantages and disadvantages and their applications

Unit III- Introduction to technical writing and presenting a research paper

Unit IV Development of skills

Sessional Work

To undertake a focused study based upon a research question and to present it in form of a research paper, compilation of study material, along with brief assignments demonstrating the steps in the research process.

Sessional Assessment

The term work in the form of notes/ assignments, as stipulated above will be assessed internally with weightage of 25 marks. Theory examination based on the aforesaid course outline for this subject will be conducted for 100 marks.

Course Outcome

Students understand the research methodology applied to different research within the subject domain of Digital architecture

Readings

1. Creswell, J. W; *Research Design: Qualitative, quantitative and mixed methods approaches*, 2nd Ed., Thousand Oaks: Sage. 2003.
2. De Vaus, D. A; *Surveys in Social Research*, Jaipur : Rawat Publications. 2003
3. Groat, L. & Wang; D. *Architectural Research Methods*, NY: John Wiley and Sons Inc. 2002.
4. Kothari, C.R; *Research Methodology: Methods and Techniques*, New Delhi: Wishwa Prakashan. 2005.
5. Sanoff, H; *Methods of Architectural Programming*, Dowden Hutchinson and Ross, Inc. Vol. 29, Community Development Series. 1977.
6. Sanoff, H; *Visual research methods in design*, USA: Van Nostrand Reinhold. 1991

SUBJECT TITLE:				
ANALYSIS SOFTWARES				
Subject Code : 2019 DA 206				
Teaching Scheme		Examination Scheme	Marks	
Theory Periods per week	1	Sessional	100	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	2	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	2	Total Marks	100	

Course Objective

To establish performance analysis as a major driver to architectural design decisions. Emphasis is to achieve a feed-back loop between the design ambitions and the physical simulations within the domain of performance based digital architecture.

Course Content:-

Unit I- Introduction of contemporary software's those are capable of inducing physical parameters into the digitally generated model to evaluate its performance wrt various parameters

Unit II- Testing the digitally generated models for their structural, environmental, thermal and material properties through computational fluid dynamics (CFD) analysis, thermal analysis, etc.

SESSIONAL WORK:

Students are expected to submit detailed reports of the tutorials they undertook with appropriate analysis of the results.

Course Outcome

The students will be able to use analytical softwares and simulation tools to drive performance based design

Readings

1. Braun. *Masterpieces: Performance Architecture + Design* .Braun publication AG
2. Padt,Inc. Introduction to the Ansys Parametric Design Language : A Guide to the Ansys Parametric Design Language. Createspace Independent Pub,

3. Stanney, K M. Handbook of Virtual Environments: Design Implementation And Applications. Laurence Earlbaum associate Publishers London
4. Lally, S.Young,J. Softspace : From Representation Of Form To A Simulation Of Space. Routledge
5. Grobman, Y. Performatism : Form And Performance In Digital Architecture Routledge

