ANNA UNIVERSITY, CHENNAI
NON- AUTONOMOUS AFFILIATED COLLEGES

| **M.ARCH (DIGITAL ARCHITECTURE) FULL-TIME PROGRAMME** |

REGULATIONS 2021
CHOICE BASED CREDIT SYSTEM

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

i. To train students to negotiate design challenges of an advanced digital society with sensitivity and context.
ii. To provide knowledge on the interaction of emerging technology with society and notions of space production.
iii. To empower architects to be effective stakeholders and leaders in the domain of contemporary architecture, in the era of big data.
iv. To add value multiplier skill sets to graduates through exploration of advanced digital design in detail and quantitative and qualitative research methods.
v. To be a part of organisations that influence policy and decision making through contributing in-depth knowledge in relevant fields of study.
vi. To prepare students to be effective participants in policy and decision making institutional frameworks.

2. PROGRAMME OUTCOMES (POs):

PO# **Programme Outcomes**
1 Postgraduates will use their design and research skills to ensure liveable and inclusive design for our increasingly digitized and automated society.
2 Postgraduates will be able to define and enhance interactions of the society with built environment at various levels through technology to bridge the digital divide
3 Postgraduates will be equipped with critical thinking & logical reasoning skills to address emerging issues of digital architecture and frame holistic solutions in institutions and organizations.
4 Postgraduates will be well versed with industry 4.0 skills, including Digital Design Processes and parametric tools, prototypes and 3D printing, cognitive computing and design automation, IoT, Building performance and research methodologies.
5 Postgraduates will be able to employ with various design theories, methodologies and processes to decode and comprehend contingencies as data, to resolve emerging global urban & environmental concerns in this era of digital data.
6 Postgraduates will be able to communicate their ideas effectively through various forms of digital media.

3. PEO/PO Mapping:

Program Educational Objective	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
I.	3	1	3	-	2	-
II.	1	3	1	3	3	1
III.	2	1	3	2	3	3
IV.	-	1	3	2	1	1
V.	3	3	-	2	2	3
VI.	3	3	2	-	2	3

PROGRAM ARTICULATION MATRIX OF PG M.ARCH DIGITAL ARCHITECTURE

		COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6
YEAR I	SEMESTER I	Computational Design and Architecture I	1	2.5	1	2.5	3	-
		Digital Fabrication	2.3	3	1	2.3	1	2.3
		Modular Architecture	2.5	1	-	2	-	3
		Society, Culture, Media and Technology	3	2.5	2	1	2.5	1
		Advanced Manufacturing and 3D Printing	-	2.5	1	2	-	2.5
		Digital Studio I : Process Based Design	2.5	1	1	2.5	1	3
	SEMESTER II	Research Methodologies for Built Environment	1	-	2.3	1	1	2.7
		Computational Design and Architecture II	1	3	1	2.5	-	3
		Metatexts in Architecture	2.5	3	3	1	2	-
		Geographical Information Systems for Built	1	-	2.7	1	2	2
		Digital Studio II : Parametric Architectural Design	3	1	2.5	3	-	1
		PROFESSIONAL ELECTIVE I						
		Culture of Public Spaces	1.5	2	-	1	1.5	-
		Advanced Graphics and Interface Architecture	1	3	-	1	2.5	1
		Digital Media	3	-	-	2.5	-	1
		Soft Skills	1.5	1	2.3	2.5	2.8	2.5
YEAR II	SEMESTER III	Digital IoT apps	1	1	-	3	1	-
		Sustainable Architecture and Environmental	3	3	2	1.5	2	-
		Dissertation	1.7	3	2	3	2.3	3
		Digital Studio III : Urban Computational Design	3	2.3	1.7	2.3	3	1.7
		PROFESSIONAL ELECTIVE II & III						
		Social Theory and the City	3	-	2.3	-	3	-
		Quantitative Techniques and Data Representation	1.5	-	2	3	3	-
		User Interface and User Experience Design (UI /	3	3	1.5	3	-	3
		Advanced BIM and Building Services	3	-	3	2	-	-
		Materials and Tectonics in DA	3	1.5	2	-	1.5	-
		Advanced Coding for Urban Design	3	3	-	3	-	-
		Psychology of Learning and Development	-	-	3	3	-	1
		INTERNSHIP TRAINING						
		Internship Training	2	1	3	3	1.5	3
	SEMESTER IV	Thesis Project	3	3	3	3	3	3
		PROFESSIONAL ELECTIVE IV						
		Ecology and Digital Architecture	-	2.5	2	2.5	2.7	-
		Bio – Mimetic Architecture	-	1	3	3	2	3
		Advanced Structures and Modular systems	-	3	-	3	3	-
		Theory of Architectural Education	-	-	3	-	-	-

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REGULATIONS 2021
CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND SYLLABUS

SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	L	T	P/S	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1.	DG4101	Computational Design and Architecture I	PCC	3	0	0	3	3
2.	DG4102	Digital Fabrication	PCC	3	0	0	3	3
3.	DG4103	Modular Architecture	PCC	3	0	0	3	3
4.	MH4151	Society, Culture, Media and Technology	PCC	3	0	0	3	3
5.		Audit Course I*	AC	2	0	0	2	0
THEORY CUM STUDIO								
6.	DG4121	Advanced Manufacturing and 3D Printing	PAEC	1	0	3	4	4
STUDIO								
7.	DG4111	Digital Studio I : Process Based Design	PCC	0	0	10	10	10
			TOTAL	**15**	**0**	**13**	**28**	**26**

 * Audit Course is optional

SEMESTER II
(Prerequisite- Pass in Digital Studio I : Process based design)

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	L	T	P/S	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1.	RM4251	Research Methodologies for Built Environment	RMC	3	0	0	3	3
2.	DG4201	Computational Design and Architecture II	PCC	3	0	0	3	3
3.	DG4202	Metatexts in Architecture	PCC	3	0	0	3	3
4.		Audit Course II*	AC	2	0	0	2	0
THEORY CUM STUDIO								
5.	MH4221	Geographical Information Systems for Built Environment	PAEC	1	0	3	4	4
STUDIO								
6.	DG4211	Digital Studio II : Parametric Architectural Design	PCC	0	0	10	10	10
			TOTAL	**12**	**0**	**13**	**25**	**23**
PROFESSIONAL ELECTIVE								
7.		Professional Elective I	PEC	X	X	X	3	3
						TOTAL	**28**	**26**

 * Audit Course is optional

SEMESTER III
(Prerequisite- Pass in Digital Studio II : Parametric Architectural Design)

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P/S		
THEORY								
1.	DG4301	Digital IoT apps	PCC	3	0	0	3	3
2.	DG4302	Sustainable Architecture and Environmental Modelling	PCC	3	0	0	3	3
STUDIO								
3.	DG4311	Dissertation	PCC	0	0	4	4	4
4.	DG4312	Digital Studio III : Urban Computational Design	PCC	0	0	10	10	10
			TOTAL	**6**	**0**	**14**	**20**	**20**
PROFESSIONAL ELECTIVE								
5.		Professional Elective II	PEC	X	X	X	3	3
6.		Professional Elective III	PEC	X	X	X	3	3
INTERNSHIP TRAINING								
7.	DG4313	Internship Training	PAEC	X	X	X	X	2
							TOTAL	**28**

SEMESTER IV
(Prerequisite- Pass in Digital Studio III : Urban Computational Design)

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P/S		
STUDIO								
1.	DG4411	Thesis Project	PCC	0	0	20	20	20
			TOTAL	**0**	**0**	**20**	**20**	**20**
PROFESSIONAL ELECTIVE								
2.		Professional Elective IV	PEC	X	X	X	3	3
						TOTAL	**23**	**23**

Total No. Of Credits: 103

PROFESSIONALCORE COURSES (PCC)

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P/S		
THEORY								
1.	DG4101	Computational Design and Architecture I	PCC	3	0	0	3	3
2.	DG4102	Digital Fabrication	PCC	3	0	0	3	3
3.	DG4103	Modular Architecture	PCC	3	0	0	3	3
4.	MH4151	Society, Culture, Media and Technology	PCC	3	0	0	3	3
5.	DG4111	Digital Studio I : Process Based Design	PCC	0	0	10	10	10
6.	RM4251	Research Methodologies for	RMC	3	0	0	3	3

S. No.	Course Code	Course Title	Category	L	T	P/S	Total Contact Periods	Credits
		Built Environment						
7.	DG4201	Computational Design and Architecture II	PCC	3	0	0	3	3
8.	DG4202	Metatexts in Architecture	PCC	3	3	0	0	3
9.	DG4211	Digital Studio II : Parametric Architectural Design	PCC	0	0	10	10	10
10.	DG4301	Digital IoT apps	PCC	3	0	0	3	3
11.	DG4302	Sustainable Architecture and Environmental Modelling	PCC	3	0	0	3	3
12.	DG4311	Dissertation	PCC	0	0	4	4	4
13.	DG4312	Digital Studio III : Urban Computational Design	PCC	0	0	10	10	10
14.	DG4411	Thesis Project	PCC	0	0	20	20	20

PROFESSIONAL ELECTIVE COURSES (PEC)

SEMESTER II, ELECTIVE I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P/S		
1.	UR4071	Culture of Public Spaces	PEC	3	0	0	3	3
2.	DG4001	Advanced Graphics and Interface Architecture	PEC	3	0	0	3	3
3.	DG4002	Digital Media	PEC	3	0	0	3	3
4.	MH4073	Soft Skills	PEC	2	0	1	3	3

SEMESTER III, ELECTIVE II & III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P/S		
1.	UR4191	Social Theory and the City	PEC	3	0	0	3	3
2.	UR4072	Quantitative Techniques and Data Representation	PEC	3	0	0	3	3
3.	DG4003	User Interface and User Experience Design (UI / UX)	PEC	3	0	0	3	3
4.	DG4004	Advanced BIM and Building Services	PEC	3	0	0	3	3
5.	DG4005	Materials and Tectonics in DA	PEC	3	0	0	3	3
6.	DG4006	Advanced Coding for Urban Design	PEC	1	0	2	3	3
7.	MH4074	Psychology of Learning and Development	PEC	3	0	0	3	3

SEMESTER IV, ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P/S		
1.	DG4007	Ecology and Digital Architecture	PEC	3	0	0	3	3
2.	DG4008	Bio – Mimetic Architecture	PEC	3	0	0	3	3
3.	DG4009	Advanced Structures and Modular systems	PEC	3	0	0	3	3
4.	MH4075	Theory of Architectural Education	PEC	3	0	0	3	3

PROFESSIONAL ABILITY ENHANCEMENT COURES (PAEC)

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	L	T	P/S	TOTAL CONTACT PERIODS	CREDITS
1.	DG4121	Advance Manufacturing and 3D Printing	PAEC	1	0	3	4	4
2.	MH4221	Geographical Information Systems for Built Environment	PAEC	1	0	3	4	4
3.	DG4313	Internship Training	PAEC	X	X	X	X	2

AUDIT COURSES (AC)
Registration for any of these courses is optional to students

SL. NO	COURSE CODE	COURSE TITLE	Lecture	Tutorial	Practical	CREDITS	SEMESTER
1.	AX4091	English for Research Paper Writing	2	0	0	0	
2.	AX4092	Disaster Management	2	0	0	0	1/2
3.	AX4093	Constitution of India	2	0	0	0	
4.	AX4094	நற்றமிழ் இலக்கியம்	2	0	0	0	

SUMMARY

Sl. No	Subject Area	I	II	III	IV	Credits Total
1	PCC	22	16	20	20	78
2	PEC	-	3	6	3	12
3	PAEC	4	4	2	-	10
4	RMC	-	3	-	-	03
	Total	**26**	**26**	**28**	**23**	**103**
5	Non-Credit	Audit Course I	Audit Course II			

DG4101　　　　　**COMPUTATIONAL DESIGN AND ARCHITECTURE I**　　　L　T　P/S　C
　　3　0　0　3

OBJECTIVES
- To provide understanding of the role of technology and digital media in contemporary architecture.
- To give knowledge about parametric design and generative / algorithmic design and the differences between them through case studies.

UNIT I　　　INTRODUCTION　　　　　　　　　　　　　　　　　　　　9
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. 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 Automation and its influence on Architectural Form and Space.

UNIT II　　　PARAMETRIC DESIGN　　　　　　　　　　　　　　　　　9
Diagrams, Diagrammatic Reasoning, Diagrams and Design Process, Animation and Design, Digital Hybrid Design Protocol, Concept of Emergence – Problematization, variable, constraints application.

UNIT III　　　GENERATIVE AND ALGORITHMIC DESIGN　　　　　　　9
Delineating design parameter- deconstructing work flows. Fractal Geometry and their properties - Architectural applications, Works of ZviHecker. 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, Cellular Automata and Architectural applications. Genetic algorithms and Design Computation

UNIT IV　　　DIGITAL MEDIA　　　　　　　　　　　　　　　　　　　9
Interactivity and connectivity to virtual data and digital information.Augmented reality - virtual to production.Digital fabrication, virtual collaboration.

UNIT V　　　CASE STUDIES　　　　　　　　　　　　　　　　　　　　9
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 & architecture, contemporary design processes and its relation to computation.

　　　　　　　　　　　　　　　　　　　　　　　　　　TOTAL: 45 PERIODS

OUTCOMES
- An understanding of the effects of contemporary theories of media on contemporary architectural design.
- An understanding of various contemporary design processes and their relation to computation

REFERENCES
1. Marcos Novak, invisible Architecture: An Installation for Greek Pavilion, Venice Biennale, 2000
2. Contemporary Techniques in Architecture, Halsted Press, 2002
3. Ali Rahim, Contemporary Process in Architecture, John Wiley & Sons, 2000

4. A. Menges, S. Ahlquist (Eds.), AD Reader: Computational Design Thinking, John Wiley & SonsLtd, (2011)
5. W. Jabi, Parametric Design for Architecture Laurence King Publishing Ltd, London, UK (2013)
6. M. Bernal, J.R. Haymaker, C. Eastman, on the role of computational support for designers in action Des. Stud., 41 (2015)
7. B. Kolarevic (Ed.), Architecture in the Digital Age: Design and Manufacturing, Taylor & Francis, New York (2003)
8. Work of Architecture in the Age of Mechanical Reproduction, Differences MIT press, 1997
9. William J Mitchell, the Logic of Architecture: Design, Computation & Cognition. MIT Press, 1995
10. C. Barrios, Transformations on parametric design models: a case study on the SagradaFamiliacolumns instances of a parametric model Proceedings of the 11th International Conference on Computer Aided Architectural Design Futures (2005)

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	1	3	1	2	3	-
02	CO2	-	2	-	3	3	-
	AVERAGE	1	2.5	1	2.5	3	-

DG4102   **DIGITAL FABRICATION**   **L T P/S C**
                                                                        3 0 0 3

OBJECTIVES
- To give exposure to various digital production tools to build artefacts as part of creative design process.
- To give knowledge about utilizing prototyping and modelling as a design medium that supports the full spectrum of digital design as a paperless process.
- To give knowledge about fabrication process in Digital Architecture as a way to bring software models into reality.

UNIT I   MATERIALS AND PROPERTIES   9
Plastics & Composites- Polymers, Thermoplastics, Honeycomb materials.
Wood and Fibrous Materials - Case Studies and Application, Laminated wood products, Veneers, Steam bent members.
Metals and Ceramics - Case Studies and Applications - Steel, Aluminium, Alloys - Ceramic Hybrids - Production and Fabrication Standards.

UNIT II   ADDITIVE FABRICATION PROCESSES   9
Additive Fabrication Processes Case Studies - Fused Deposition Processes - Injection Molding, Roto-Molding- Casting Technologies - 3D Printing (SLA, SLS, FDM)

UNIT III   SUBTRACTIVE FABRICATION PROCESSES   9
Subtractive Fabrication Processes Case Studies - Laser Cutting [vaporization cutting and industrial manufacturing] - Water Jet Processes - CNC 3, 5, & 7 Axis Milling, Cutting, Planing, Drilling.

UNIT IV   TRANSFORMATIVE FABRICATION & MASS PRODUCTION MANUFACTURING PROCESSES   9

Transformative Fabrication Processes Case Studies- Methods of Factory-Based production

UNIT V   EXPERIMENTAL FABRICATION PROCESSES   9

Experimental Fabrication Processes Case Studies - Biological Growth Formation - Crystal Structure Formation - Explosion Forming - Muscle Wire and Self-Assembling Structures

TOTAL: 45 PERIODS

OUTCOMES
- Awareness to the machines, different methods of fabrication and the workability with materials.
- Ability to correlate between the design processes and Digital Prototype or Model attributes.

REFERENCES
1. BrankoKolarevic and Kevin Klinger, Manufacturing Material Effects: Rethinking Design and Making in Architecture, 2014
2. Digital Fabrication, Paul Andersen, David Salomon, Sanford Kwinter, David Carson, Architecture of Patterns, W. W. Norton & Co, 2010
3. Heino Engel, Structure Systems, 1997
4. Lisa Iwamoto, Digital Fabrications: Architectural and Material Techniques, Princeton: Princeton Architectural Press, 2009
5. BrankoKolarevic, Architecture in the Digital Age: Design and Manufacturing, London: Taylor & Francis, 2005
6. Bob Shiel, Ruairi Glynn, Fabricate: Making Digital Architecture, Toronto: Riverside Architectural Press, 2011
7. Emergent Design Group, Morphogenetic Design Strategies AD, 2004
8. FarshidMoussavi, Daniel Lopez, Garrick Ambrose, Ben Fortunato, Ryan R. Ludwig and AhmadrezaSchricker, The Function of Form
9. RivkaOxman and Robert Oxman, The New Structuralism: Design, Engineering and Architectural Technologies
10. Michael Weinstock, Michael Hensel, Achim Menges (eds.), Emergence: Morphogenetic Design Strategies, AD, Vol 74, No. 3, May/June 2004

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	3	1	2	-	2
02	CO2	2	3	-	2	-	3
03	CO3	2	3	-	3	1	2
	AVERAGE	2.3	3	1	2.3	1	2.3

MH4151   SOCIETY, CULTURE, MEDIA AND TECHNOLOGY   L T P/S C
**   3 0   0 3**

OBJECTIVES
- To introduce the interdisciplinary field of research, science, technology and society studies.
- To create awareness of the interface between science, technology and society from a theoretical perspective.

UNIT I   SOCIOLOGY OF SCIENTIFIC KNOWLEDGE   9

Relationship between science and the social, Conventional view of philosophers and historians of science, Sociology of Science (Karl Manheim-Robert K. Merton), Social Function of Science (Joseph Bernal).The Radical Science Movement- the Kuhnianintervention. Science as a social activity: Strong Program, Laboratory Studies/ethnography of science, Actor Network Theory (Bruno Latour).Communicating science to peers, scientific controversies, public engagement with Science &Technology -the changing configuration of science, mode II knowledge production.

UNIT II   TECHNOLOGY – SOCIETY INTERFACE I   9

Techno science and the Interpenetration of Science & Technology

Questioning of the traditional boundary between science (knowing) and technology (doing). How science and technology together shape the ways in which knowledge is constructed. Technological Determinism, Power and the Politics of Knowledge Production.

UNIT III   TECHNOLOGY – SOCIETY INTERFACE II   9

Technology in Context: Perspectives in Science, Technology and Society (STS) Studies.

Various perspectives on Technology in Science, Technology and Society(STS) studies; Social Shaping of Technology - Social Construction of Technology, Actor Network Theory, Transition in Socio-Technical Systems. Multi-Level Perspective, Critical Theory of Technology.Contributions of Trench, Lewenstein, Jasanoff&Vishvanathan--governance and ethical issues in the context of emerging technologies.Influence of local contexts —democratisation and 'up-stream' public engagement with technology.

UNIT IV   NEW MEDIA   9

The new communication paradigm brought about by digital technologies. Digitality (Digital versus Analogue Media) – Interactivity, Extractive versus immersive navigation, Registrational Interactivity and Interactive communication – Hypertextuality - Networked Media -Virtuality

UNIT V   VISUAL CULTURE   9

Introduction and definitions of Visual Culture- Visual Culture Studies - New ways of seeing – Decoding Images – Visual Cultural Perspectives – High and low culture – Images and Power – Images and Ideology – Picture Theory – Representation – Image and Meaning – The myth of the Image – Medium is the Message

TOTAL: 45 PERIODS

OUTCOMES

- Understanding of trends that problematised production of scientific knowledge and the sociology of scientific knowledge
- Familiarity with the technology-society interface from a wide range of theoretical standpoints such as social shaping of technology, social constructionist and actor network theoretical perspectives.
- Understanding of science and technology as socially and culturally embedded activities.

REFERENCES

1. Collins, Harry and Pinch, Trevor 1993. The Golem: What Everyone should Know about Science. Cambridge: Cambridge University Press.
2. Hess, David J. 1995. Science and Technology in a Multicultural World: The Cultural Politics of Facts and Artefacts. New York: Columbia Press.
3. Hess, David J. 1997. Science Studies: An Advanced Introduction. New York: NewYork University Press.
4. Jasanoff, Sheila et al. (eds.). 1995. Handbook of Science and Technology Studies. Thousand Oaks, CA: Sage Publications.
5. MacKenzie, Donald and Judy Wajcman 1999 (eds.). The Social Shaping of Technology, 2nd edition, Open University Press.

6. Sismondo, Sergio 2010. An Introduction to Science and Technology Studies (2nd edition). Chichester: Wiley-Blackwell.
7. Mirzoeff, Nicholas, An Introduction to Visual Culture, Routledge
8. Bijker, Wiebe E. et al. 1989. The Social Construction of Technological Systems. Cambridge, MA: MIT Press.
9. Bloor, David 1976. Knowledge and Social Imagery, second edition, London: Routledge and Kegan Paul.
10. Mccluhan,Marshall,The Medium is the Message,From Understanding Media:The Extensions of Man.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	2	2	1	2	1
02	CO2	3	3	2	-	3	-
	AVERAGE	3	2.5	2	1	2.5	1

DG4103 **MODULAR ARCHITECTURE** **L T P/S C**
3 0 0 3

OBJECTIVES
- To introduce the idea of mass production and advance building technologies in architecture
- To introduce advanced materials and pre-fabricated modules.

UNIT I   INTRODUCTION   9
Introduction to prefabrication, manufacturing, modular, flat pack modular, volumetric modular - Modular co-ordination, standardization and tolerances - Moulds –construction design, maintenance techniques. Utopian concepts, principles and ideology on modular construction like pug in cities etc., - Philosophies of fuller, Corbusier, Eames, Scott Brown, Timberlake etc.,

UNIT II   TECHNIQUES AND INDUSTRIAL STRUCTURES   9
Modular casting techniques - Planning, analysis and design considerations - Handling techniques - Transportation Storage and erection of structures.Tectonic strategies- structural core systems – Delivery strategies - Joints -Curing techniques - skeletal and large panel constructions.

UNIT III   DESIGN PRINCIPLES AND APPLICATION   9
Disuniting of structures - design of cross section-based efficiency of material – problems in design because of joint flexibility – allowance for joint deformation – joints for different structural connections – modular technology for low cost and mass housing schemes. Small products like door frames, shutters in housing - Water tank service core unit. Quality control - Repairs and economical aspects on prefabrication.

UNIT IV   DIGITAL FABRICATION   9
Study of various industrial mass production systems - CNC cutting and milling (for mass customization)- Laser Cutting -3D Printing (SLS & FDM) & 3D Scanning **-** 3Axis CNC cutting & milling on non-planar surfaces. Digital & analogue experiment on various materials and their challenges.

UNIT V   BEST PRACTICES   9
Understanding and exploring the various successful project at national and international level on the aspects of Material, Mass Production, Finance / project costing, climate response and energy efficiency.

TOTAL: 45 PERIODS

OUTCOMES
- Knowledge about modular construction techniques in architecture.
- Knowledge of various structural and design principle thorough various case studies.

REFERENCES
1. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001.
2. Hand Book on Construction Safety Practices, SP 70, BIS 2001.
3. John Fernandez, Material Architecture, Architectural Press, UK.
4. Peurifoy, R.L., Ledbette. W.B., Construction Planning, Equipment and Methods, McGraw Hill Co., 2000.
5. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997
6. Peters, S.(2010) Material Revolution : Sustainable And Multi-Purpose Materials For Design And Architecture. Birkhäuser Architecture
7. Borden, G P. Matter: Material Processes In Architectural Production. Routledge
8. Lindsey, B. (2001) Digital Gehry: Material Resistance Digital Construction.Birkhäuser Basel

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	1	-	2	2	2
02	CO2	2	-	-	2	-	1
03	CO3	2.5	1	-	2	2	1.5

DG4121 **ADVANCED MANUFACTURING AND 3D PRINTING** **L T P/S C**
1 0 3 4

OBJECTIVES
- To impart design thinking, knowledge and skills related to advanced manufacturing (additive manufacturing and 3D printing technologies).
- To provide familiarity with tools, material and equipment related to additive manufacturing and 3D printing.

UNIT I INTRODUCTION 10
Introduction to Advanced manufacturing types and processes. Emergence of 3D printing and AM, additive manufacturing. Differences between AM, additive manufacturing design process vs. conventional DTM, design theory and methodology, with respect life-cycle objectives. Additive manufacturing applications for rapid prototyping to the end-of-use product manufacturing process. Additive Manufacturing Application Domains: Aerospace, Electronics, Health Care, Defense, Automotive, Construction, Food Processing,

UNIT II ADDITIVE MANUFACTURING AND 3D PRINTING ENABLED DESIGN PROCESS 10
Design thinking and advanced manufacturing. Parametric design and additive manufacturing.Rapid prototyping, rapid tooling and Rapid manufacturing. Design and shape complexity, material complexity, hierarchical complexity, and functional complexity in additive manufacturing. Function integration and structure optimization in additive manufacturing. Impact of AM on conventional DTM and manufacturing, in terms of design for manufacturing (DFM), design for assembly (DFA) and Design for Performance (DFP).Story boarding additive manufacturing process.

UNIT III ADDITIVE MANUFACTURING TECHNIQUES, MATERIALS AND EQUIPMENT 10
Stereo- Lithography, LOM, FDM, SLS, SLM, Binder Jet technology. Process, Process parameter, Process Selection for various applications.MachineTools.Materials- Polymers, Metals, Non-Metals, Ceramics.Various forms of raw material- Liquid, Solid, Wire, Powder; Powder Preparation and their desired properties, Polymers and their properties.Materials and Equipment.

UNIT IV   ADDITIVE MANUFACTURING CODING, TOOLS AND PARAMETRIC DESIGN 15
CAD Data formats, Data translation, Data loss, STL format. C and tools for additive manufacturing. Coding, visual scripting and software tools for parametric design and additive manufacturing

UNIT V   ADDITIVE MANUFACTURING PROJECT   15
Design methodologies, parametric processes and tools of additive manufacturing will be deployed in a parametric design and additive manufacturing project.

TOTAL: 60 PERIODS

OUTCOMES
- An understanding of additive manufacturing design process and wide scope of application.
- Knowledge on appropriate tools, materials and equipment for additive manufacturing and 3D printing process
- Knowledge of design process and skill sets for parametric design and additive manufacturing.
- Ability to process 3D models using tools and coding to the required formats in order to transfer them for production

REFERENCES
1. Lan Gibson, David W. Rosen and Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
2. Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Hanser Publisher, 2011.
3. CK Chua, Kah Fai Leong, "3D Printing & Rapid Prototyping- Principles & Applications", WS, 2017.
4. Digital processes, planning, design and production - Haus Child and Kareem, Birkhauser, 2011
5. J.D. Majumdar and I. Manna, "Laser-Assisted Fabrication of Materials", Springer Series in Material Science, 2013.
6. L. Lu, J. Fuh and Y.S. Wong, "Laser-Induced Materials and Processes for Rapid Prototyping", Kulwer Academic Press, 2001.
7. Zhiqiang Fan And Frank Liou, "Numerical Modelling of the Additive Manufacturing (AM) Processes of Titanium Alloy", InTech, 2012.
8. Daniel G. Parolek, Karen Parolek, Paucl C. Cram, Form Based Codes, John Wiley 2000

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	-	3	1	2	-	3
02	CO2	-	2	1	2	-	2
	AVERAGE	-	2.5	1	2	-	2.5

DG4111   DIGITAL STUDIO I: PROCESS BASED DESIGN   L T P/S C

0 0 10 10

OBJECTIVES
- To give understanding of importance of diagramming and translating the ideas into geometry.
- To give exposure to the various processes of user centric designs and computer exploration of form finding for smaller scale spaces or products.
- To give understanding of principles behind product design, explore tools and techniques for prototyping.
- To give exposure to the various methods of manual or 3D printed prototyping

CONTENT

This course will emphasise on designing and prototyping a product or small scale space. The design process involves identifying the user needs, analyzing the product attributes such as function, emotions, Diachronic, Synchronic, parallel situations, future situations etc.

Analyze selective products to understand its geometry, mathematical principles, materials and technique behind manufacturing the product, ergonomics user analysis, techniques behind its prototyping and also analyze its packing and display designs. After the user centric analysis the concept of translating ideas into geometry and form generation or form finding can be made with the help of Computer Explorations of Fractals, Chaos, Complex Systems, Shape grammar, generative iterations and exploring the 3D lattice and structures.

The design detailing can be based on modularity and modular systems for mass production, study on various materials for prototyping and algorithm of packing design and display system of the designed product. The design output can be any product not limited to furniture /kiosk / bus-stop or bus shelter / street furniture/ packaging design/ book shelf/ workstations/speaker design/mouse/ other small products. The final design output should be explored with different types of prototype fabrications. The prototype fabrications can be either of manual or 3d printing.

OUTCOMES
- Understanding of the concepts and basics of mathematics (Geometry) behind computational design.
- Basic knowledge of 3D Modelling and prototyping techniques.

TOTAL: 150 PERIODS

REFERENCES
1. Coelho, Denis, ed. Industrial Design: New Frontiers. BoD–Books on Demand, 2011.
2. Ulrich, Karl T. Product design and development.Tata McGraw-Hill Education, 2003.
3. Gary William Flake: The Computational Beauty of Nature: Computer Explorations of Fractals, Chaos, Complex Systems, and Adaptation.MIT Press 1998.
4. Falconer, Kenneth (2003). Fractal Geometry: Mathematical Foundations and Applications. .
5. John Maeda: Design by Numbers, MIT Press 2001.
6. Hekkert, P.; Schifferstein, H. (2008). Product experience. Amsterdam: Elsevier Science Limited.
7. Baird, Eric. Alt. Fractals: A visual guide to fractal geometry and design.Chocolate Tree Books.
8. Norman, D. (2013). The Design of Everyday Things: Revised and Expanded Edition. New York: Basic Book.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	1	-	2	1	3
02	CO2	2	1	-	3	1	3
03	CO3	2	-	1	3	-	3
04	CO4	3	1	1	2	-	3
	AVERAGE	2.5	1	1	2.5	1	3

RM4251   RESEARCH METHODOLOGIESFORBUILTENVIRONMENT   L T P/S C
                                                                    3 0 0 3

OBJECTIVES
- To give introduction to the importance of critical inquiry as away of gaining knowledge and adding to it through research.
- To give exposure to the various forms of research and research methodologies/ processes.
- To understand research in the specific domain of built environment research.

UNITI   INTRODUCTION   9
Basic research issues and concepts. Orientation to research process. Types of research: historical, qualitative, co-relational, experimental, simulationand modelling, logical argumentation, casestudy and mixed methods. Illustration using research samples including research in the domain of built environment.

UNITII   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 including research in the domain of built environment.

UNITIII   RESEARCHINGAND DATACOLLECTION   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-Primary sources: observation and recording, interviews structured and unstructured, questionnaire, open ended and close ended questions and the advantages, sampling. Collecting data from secondary sources.

UNITIV   REPORTWRITING   9
Research writing in general and its components. Developing the outline, referencing, writing the bibliography, presentation,etc.

UNITV   CASE STUDIES   9
Case studies of competent research, from project inception to completion with a focus on research in the domain of built environment. Review of research publications.

TOTAL: 45 PERIODS

OUTCOME
- Skill to identify, decipher and interpret issues relating to architecture based on research enquiry methods.
- Knowledge of different methods of conducting research and research writing.
- Familiarity with specific research related to built environment.

REFERENCES
1. Linda Groat and DavidWang, 'Architectural ResearchMethods',2ndedition,JohnWileyand Sons Inc, Hoboken, NewJersey, US,2013.
2. Wayne C Booth,Joseph MWilliams Gregory G.Colomb, 'The Craft of Research',3rdEdition, Chicago Guides to Writing, EditingandPublishing,2008.
3. IainBorden and Katerina Ruedi,'The Dissertation: An Architecture Student's Handbook', Edition 2,Architectural Press, 2005
4. Ranjith Kumar, 'Research Methodology-AStepbyStepguideforBeginners',4th Edition, Sage Publications,2014.

5. John WCreswell, 'Research Design: Qualitative, Quantitative and Mixed Methods Approaches', Sage Publications, 2013.
6. JASmith, PFlowers, MLarkin, 'Interpretative Phenomenological Analysis: Theory, Method and Research (English), IEdition, Sage Publications,2009.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	1	-	2	1	-	3
02	CO2	-	-	3	1	-	2
03	CO3	-	-	2	1	1	3
	AVERAGE	1	-	2.3	1	1	2.7

DG4201   **COMPUTATIONAL DESIGN AND ARCHITECTURE II**   **L T P/S C**
                                                                      3 0 0 3

OBJECTIVE
- To learn how to use generative design & generative system architecture and their relation to computation.
- To highlight the importance of using computer as a generative tool in the design process depending on scripting and algorithmic architecture approach of designing.

UNIT I GENERATIVE DESIGN AND GENERATIVE SYSTEM   **7**
Introduction, definitions and Properties of Generative design. Difference between traditional method of design and generative design. Generative system design in Architecture- Definition, historical background. Generative design process and its categories. Algorithmic generative systems, Parametric systems and Formalisms- L-systems, Cellular automata systems, Fractal systems and Shape grammars. Categories of Generative Model.

UNIT II INTRODUCTION TO COMPUTATION AND PROGRAMMING   **8**
Introduction. Differences between Computation and Computerization. Visions about Using Computers in the Design Process. Introduction to Computational Design Techniques. Characteristics of computational design techniques- Geometry – Composition - Algorithmic thought

UNIT III ALGORITHMIC DESIGN   **6**
Definition of Algorithm and Algorithmic Design. Requirements of Algorithmic design. Algorithmic problems classification and problem solving. Algorithms in Computational Design. Introduction to programming. Coding, Scripting and Modeling methods in Architecture. Classification of Programming languages.

UNIT IV INTRODUCTION TO CODING   **12**
Introduction to programming and the Python language. Variables, Conditionals, Lists, Loops, Functions, Strings, Tuples, Sets and PyCharm in Python. Loading and Storing data in Python. Python for Rhino. Importing Rhino Commands. Case studies.

UNIT V MORPHOGENETIC DESIGN   **12**
Introduction and definition of Morphogenesis. Morphogenesis in Architecture. Digital Morphogenesis/Computational Architecture and its classification- Topological architecture, Isomorphic architecture, Animate architecture, Metamorphic architecture, Parametric architecture and Evolutionary architecture. Digital Morphogenesis and its implication- emergence, self-organization and form-finding.

TOTAL: 45 PERIODS

OUTCOME
- Understanding of the effect of advanced computational methods on contemporary architectural design.
- Understanding of various contemporary design techniques and their relation to computation

REFERENCES
1. Ahlquist, S., &Menges, A. (2011). Computation Design Thinking. New Jersey: John Wiley and Sons Ltd
2. Hensel, M., Menges, A., &Weinstock, M. (2010). Emergent technologies and design: towards a biological paradigm for architecture. London: Routledge.
3. Python: The Complete Reference by Martin C Brown, McGraw Hill Education; Fouth Edition, 2018
4. Emergence Morphogenetic Design Strategies by Michael Hensel, AchimMenges, Michael Weinstock, Architectural Design Journal.2004.
5. Techniques and Technologies in Morphogenetic Design, Michael Hensel, AchimMenges + Michael Weinstock, Architectural Design Journal, 2006.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	1	3	1	2	-	3
02	CO2	-	3	1	3	-	3
	AVERAGE	1	3	1	2.5	-	3

DG4202 **METATEXTS IN ARCHITECTURE** **L T P/S C**
3 0 0 3
OBJECTIVE
- To give knowledge about the role of texts in understanding various contradictions and formulation of thought in architecture.
- To give knowledge about the trajectory of architectural profession in India and abroad, in reference to the field of digital architecture.

UNIT I ARCHITECTURAL PARADIGM I: ROUTE TO MODERNISM 8
The ten books on architecture – Marcus Vitruvius; Scientific classification in history of architecture by sir Banister Fletcher; Fermentation in Architecture – Hans Poelzig; Ornament and crime - Adolf loos; Organic Architecture -F.L.Wright;The tall office building artistically considered- Louis Sullivan; Futurist Architecture - Antonio Sant'Elia; The new ideas on architecture – Walter Gropius and Brouno Tout; Towards an architecture by Le Corbusier; Analytical and Utopian Architecture – AurthorKrun; Towards a plastic Architecture – Van Doesburg; Industrialised Buildings, Technology and Architecture – Meis van der Rohe; Universal Architecture – Buckminister Fuller; Team 10 Primer – Aldo Van Eyck, Alison and Peter Smithson.

UNIT II ARCHITECTURAL PARADIGM II: RESPONSES TO MODERNIST CRISIS 7
Territory of architecture - Vittorio Gregotti; Complexity and contradiction in architecture – Robert Venturi; Post Functionalism- Peter Eisenman; The case of figurative Architecture – Michael graves;Aesthetics of architecture -Roger Scruton;Post-modern Architecture – ChalesA.Jencks;introduction to five architects – Colin Rowe; Towards a Critical Regionalism - Kenneth Frampton; Towards new horizons in architecture – Tada Ando; Towards a critique of architectural Ideology-ManfredoTafuri.

UNIT III THEORETICAL PARADIGMS OF POSTMODERNISM 9
Theoretical paradigms from social theories that shaped the architectural theories of late 20th century – Phenomenology:Building, Dwelling, Thinking- martin Heidegger; Genius Loci - Christian Norberg-Schulz; social construct of place – Henri Lefebvre and Gaston Bachelard. Aesthetics of sublime: The Work of Art in the Age of Mechanical Reproduction and the idea of flaneur – Walter

benjamin; theoretical works of Siegfried Kracauer on ornamentation. Lingustics: Semiotics and Architecture -The "Deep Structures" of language, The structure of society- from strauss to Barthes, Rediscovering the meanings in architecture. Ideology and space: Frommarx to Marxism, Marxist interpretation of built spaces and the city – Ideology of Foucault, Debord, Simon Sadler and David Harvey.Body and Space: tendencies and trajectories: Feminist approaches in architecture- Jane Rendell.

UNIT IV   THEORIES OF THE POSTMODERN CITY   9

The life and Death of Great American Cities- Jane Jacobs; Defensible cities - Oscar Newman; The collage city – Colin Rowe; The Architecture of the city – Aldo Rossi; The structure of the ordinary - N. John Habraken; The Meaning of the Built Environment by Amos Rapoport;Pattern language by Christopher Alexander; Learnings from Lag vegas - Denise Scott Brown and Robert Venturi; Image of the city – Kevin Lynch;what would now sexist city would look like? - Dolores Hayden; whatever happened to urbanism?- Rem Koolhaas. Understanding architecture and urbanism of the Indian Cities - After the masters (Contemporary Indian Architecture) -Peter Scriver and Vikram Bhatt.

UNIT V   ARCHITECTURE OF THE CONTEMPORARY CITY   12

Architecture Depends – Jermy Till; Visions Unfolding – Architecture in the age of electronic media- Peter Eisenman; architecture and the disjunction – Bernard Tschumi; Cradle to Cradle: Remaking the Way We Make Things - Michael Braungart and William McDonough;Notes around the Doppler Effect and Other Moods of Modernism - Robert Somol and Sarah Whiting; The case for the Tectonic – Kenneth Frampton; Materialtendencies - Jeanne Gang; Ebodies, E cities, E buildings - William Mitchell; Digital culture in architecture - Antoine Picon; Towards performance driven computational geometry – Neri Oxman; The Geometry of Feeling – Juhani Pallasma; System thinking Revisited – Francis Duffy; Performative architecture – Branko Kolarevic; Adaptive strategies- Simosyannas.

TOTAL: 45 PERIODS

OUTCOME
- An understanding of various design theories, methodologies and perspectives to comprehend the contradictions in the field of Architectural design.
- An ability to understand the digital design and its impact on production practices which will guide them to future research and development.

REFERENCES
1. Jencks, Charles, and Karl Kropf. Theories and Manifestoes of Contemporary Architecture. Wiley-Academy, 2006.
2. Gausa, Manuel. The Metapolis Dictionary of Advanced Architecture. Actarbirkhauser, 2003.
3. Hays, K. Michael. Architecture Theory since 1968. MIT Press, 2000.
4. Braham, William W., and Jonathan A. Hale. Rethinking Architectural Technology. London: Routledge, 2013.
5. Picon, Antoine. Digital Culture in Architecture: An Introduction for the Design Professions. Birkhäuser, 2010.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	2	3	3	1	2	-
02	CO2	3	3	3	1	2	-
	AVERAGE	2.5	3	3	1	2	-

MH4221 GEOGRAPHICAL INFORMATION SYSTEMS FOR BUILT ENVIRONMENT L T P/S C
                                                                          1 0 3   4

OBJECTIVES
- To introduce role of GIS in built environment.
- To give basic familiarity with the concepts, tools and techniques of GIS
- To give training in the application of GIS for built environment.

UNIT I   INTRODUCTION TO G.I.S   9
Introduction to Geographical Information System(GIS).Defining the objectives of GIS in problems related to the macro environment. Outline of commercial and open source GIS software and introduction to basic components of GIS software. Outline of Spatial and non spatial data. Understanding of Projection and Coordinate systems. Preparation of map with appropriate format for specific purposes.

UNIT II   SPATIAL AND ATTRIBUTE DATA INPUT   18
Passive and Active Remote Sensing, Image Processing – Spectral Signature Curve, GPS, Aerial Photograph, Satellite Imagery, LIDAR and Drones. Identification of required spatial data layers. Coding schemes. National Urban Information System. Digitisation of spatial data. Editing. Geo-referencing of Satellite Imagery, Cadastral Map, Role of attribute data in defining geographic features. Adding attribute data file. Topology generation. Joining attribute data to its geographic features

UNIT III   SPATIAL ANALYSIS USING GIS   18
Generation of 3-D Model in GIS. Performing overlay functions. Manipulating attribute data. Preparation of Existing Land use. Map and report generation. Network Analysis.

UNIT IV   MODELLING THE MACRO ENVIRONMENT   15
Need for modelling the macro environment for different scales and purposes. Modelling for suitability/ projects/ situations/ problems in the realm of landscape design, urban design, urban and environmental planning.

TOTAL: 60 PERIODS

OUTCOMES
- Awareness of GIS and the context of its use for different purposes.
- Knowledge of concepts, techniques, methods of GIS.
- Ability to apply GIS for specific situations/ realms involving the built environment.

REFERENCES
1. Arthur. H. Robinson et al., 'Elements of Cartography', John Wiley & Sons, New York, 1995.
2. Judith. A. Tyner, ' Principles of Map Design', The Guilford Press, New York, 2010.
3. Ramesh Elmasri and Shamkant.B.Navate, 'Fundamentals of Database Systems', Pearson Education Limited, USA, 2010.
4. AnjiReddy.M., 'Text book of Remote Sensing and Geographical Information Systems', B.S.
5. Publications, Hyderabad, 2008.
6. Michael Law and Amy Collins, 'Getting to know ArcGIS Pro', ESRI Press, USA, 2016.
7. Paul. D. Zwick and Margaret.H. Carr, 'Smart Land-use Analysis: The LUCIS Model', ESRIPress, USA, 2007.
8. David Maquire,Michael Batty and Michael F.Goodchild,'GIS,Spatial Analysis and Modeling', ESRI Press, 2005.
9. Cynthia A.Brewer,'Designing Better Maps: A Guide for GIS Users'–2nd Edition, ESRIPress,2015.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	1	-	3	1	2	2
02	CO2	-	-	2	1	3	2
03	CO3	-	-	3	1	1	2
	AVERAGE	1	-	2.7	1	2	2

DG4211   DIGITAL STUDIO II : PARAMETRIC ARCHITECTURAL DESIGN   L T P/S C
                                                                   0 0 10 10

OBJECTIVE
- To introduce explorative and creative thinking expressed through the application of digital software to design propositions.
- To develop the ability to use digital software for the development and execution of a designed building typology, parametrically.

COURSE CONTENT
The course will focus on the design and development of built spaces using parametric design softwares and digital design tools. This architectural design process will be collaborative, iterative and with an evolutionary vector framework.

There will be emphasis on diagramming in analysis and data mapping, followed by their translation into parametric platforms. These platforms are powerful design tools that augments the design and execution process.

From the project brief, individual visual communication concepts can be developed and documented. Campus studies and sketch walks are done to help prepare cognitive diagramming, figure-ground analysis with satellite images and ground corroboration.

Based on the design objectives, appropriate vector oriented software are chosen as a designing tools. Creative design outcomes are to be developed in a digital environment with reference to appropriate parametric software used for designing a building typology.

The studio will focus on parametric design process and will demonstrate link between the employment of advanced digital design tools and the realm of digital fabrication through a built form within an architectural domain that will augment the character of a specific built environment. Probable projects may include hospitality projects, housing and high rise buildings etc.
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.

TOTAL: 150 PERIODS

OUTCOME
- Understanding the application of Parametric Design principles in Digital architecture.
- Knowledge on advanced digital design tools.

REFERENCES
1. Techniques and technologies in morphogenetic design (Architectural Design). Hoboken, NJ: John Wiley & Sons, Inc.
2. From control to design: Parametric/algorithmic architecture. Barcelona, Spain: Actar. Meredith, M., Aranda, B., Lasch, C. &Sasaki, M. (Eds.). (2008).
3. Digital fabrications: Architectural and material techniques. New York, NY: Princeton Architectural Press. Iwamoto, L. (2009).
4. Elements of Parametric Design, Routledge New York, Woodbury, Robert.
5. Matlab: A practical introduction to programming and problem solving. Burlington, MA: Butterworth-Heinemann. Attaway, S. (2009).

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	1	3	3	-	1
02	CO2	3	-	2	3	-	1
	AVERAGE	3	1	2.5	3	-	1

DG4301   **DIGITAL IOT APPS**   **L T P/S C**
                                                                                              3 0   0   3

OBJECTIVE
- To enable students to understand IoT and IoT application in Building Management System.
- To familiarize students with IoT architecture, interface and key design considerations.

UNIT I INTRODUCTION   9
IoT basics. IoT architecture. Building management systems (BMS) and Automation. Interface of IoT networks and BMS. IoT based analytical platforms. IoT ecosystems. IoT and Big Data interface.

UNIT II SENSORS, DEVICES AND CONNECTIVITY   9
Hardware capabilities. Scaling and operations. Manufacturing and getaways. Introduction to connectivity. LPWAN, Cellulat, Satellite, WiFi and Bluetooth. Interface with BMS.

UNIT III DATA PROCESSING   9
Introduction to cloud. Introduction to IoT platforms. Choosing an IoT platform. APIs. Data Analytics vs Machine learning

UNIT IV USER INTERFACE AND USER EXPERIENCE   9
Basics of UX and UI. Native apps and web apps, hybrid apps, beyond mobile apps. UX and UI protocols for IoT. BMS UX and UI. Key considerations for UI design for IoT: user profile, alerts and notifications, responsiveness.

UNIT V THE FUTURE OF IOT   9
Intelligent, efficient and user friendly IoTs, IoTs for large building complexes and master plans. IoT and the city. Simple IoT apps for BMS, Occupancy monitoring and estimation model, leveraging of IoT data, tenant experience, service innovation, innovations for smart cities, etc.

TOTAL: 45 PERIODS

OUTCOME
- Understanding the key role of IoT in BMS.
- An understanding of IoT architecture and key design parameters for responsive UI and UX.
- Knowledge of necessary software, hardware, platform, protocols across the modules wherever it is required.

REFERENCES
1. Jan Ho¨ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols, Wiley, 2012
3. ArshdeepBahga, Vijay Madisetti, Internet of Things, Hands-on approach, University Press, 2015
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Thingsǁ, Springer, 2011.
5. Simon Monk, ―Programming Arduino, McGrawHill Michael Margolis, ―Arduino Cookbook, O'Reilly

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	1	1	-	3	1	-
02	CO2	1	1	-	3	1	-
	AVERAGE	1	1	-	3	1	-

DG4302   SUSTAINABLE ARCHITECTURE AND ENVIRONMENTAL MODELLING   L T P/S C
                                                                      3 0 0 3
OBJECTIVE
- To train students in Incorporating digital tools in creating more sustainable and adaptive structures.
- To give knowledge about responsive forms of architecture, through the precision guided by digital tools.

UNIT I   INTRODUCTION TO SUSTAINABLE ARCHITECTURE   9
Role of traditional practices and development of those practices, Definitions, Opportunities in Contemporary architecture, minimization of energy usage in all building processes. Passive systems, life cycle assessment. Effects of work cycle and energy consumption of an individual.
Innovative materials and products to formation of regenerative building materials, Green facades and building envelops. Assessments of building materials: ecological impacts, integrated systems inclusive of recycle, reuse, reduce and recovery, Eco-design and Eco-labelling.

UNIT II   BUILT ENVIRONMENT AND ENVIRONMENTAL ASSESSMENT METHODS   7
Design with nature and Passive systems, Building information modelling and transformative design, role of circular economy, smart houses and flexible designs, tall building and digitally induced sustainable techniques, brown field projects, Cognitive empirical and simulation assessment methods.

UNIT III   MATHEMATICAL MODELS TO ASSESS BUILDING PERFORMANCE   11
Mathematics behind building performance simulation (BPS), basic relationships of BPS systems such as climate analysis (ambient air temperature, RH, Radiation, wind velocity and direction), thermal comfort (PPD &PMV concepts, Radiant asymmetry, CO_2 concentration, Indoor air quality), energy calculations (cooling and heating energy demands, Load profiles-lighting and auxiliary systems, system sizing), daylight simulation (BIS method, Daylight factor method, overshadowing etc.). Case studies based on manual calculations of existing building examples.

UNIT IV   ADVANCE BUILDING SIMULATION AND ENERGY MODELLING   11
Integration of simulation tools with BIM, RAPID ENERGY MODELLING. Modeling and performance simulation of existing buildings – residential and institutional. Urban Environmental Modelling.

UNIT V   CROWDSOURCING AND COMMUNITY PARTICIPATION   7
Education and training for Community participation and consumer engagement. Ecological and cultural sensitivity: Study of occupants' behavior, post-occupancy evaluation and end use energy efficiency, influence of the micro climate through urban landscaping, agriculture and green spaces

                                                                    TOTAL: 45 PERIODS
OUTCOME
- An understanding about how unique and individually a unit has to function for it to be sustainable.
- An ability to work with Energy optimization methods to be devised in assessments for audits.

- Knowledge on environmental assessment methods, audit and simulation techniques.
- Ability to add value to architectural design processes and equip students with energy modelling skills.

REFERENCES
1. Clarke, J.A., "Energy simulation in building design", Adam Hilger Ltd, Bristol, 1985
2. Energy Audit of Building Systems – MoneefKranti (Ph. D) – CRC Press 2000
3. ESRU. "ESP – A Building Energy Simulation Environment; User Guide Version 9 Series. "ESRU Manual U 96/1, University of Starthclyde, 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)
5. Robert B. Bechtel and Arza Churchman "Handbook of Environmental Psychology", John Wiley & Sons Inc., New York 2002

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	3	2	2	2	-
02	CO2	3	3	2	1	2	-
	AVERAGE	3	3	2	1.5	2	-

DG4311	**DISSERTATION**	**L T P/S C**	
		0 0 4 4	

Each student is required to prepare a disseration on a subject concerning Digital Architecture and design media , under the guidance of an advisor, approved by the department.

OBJECTIVE
- To expose the students to the various thrust areas in Digital architecture.
- To inculcate the spirit in the students to research in the field of Digital architecture by providing opportunities to read on various issues.
- To help students enhance their technical writing and interdisciplinary research skills.

PROCESS

The primary objective of the dissertation is to provide an opportunity to each student to undertake in-depth and original study research in the field of their interest. It also provides an opportunity to synthesize knowledge and skill-sets, acquired through theory courses and digital architecture studios.

Dissertation is a self-directed exploration of any topic of the students' choice – a written document of the student's findings in a chosen specific area of interest within the realm of digital architecture through a rigorous process of original research. The subject of the dissertation may be theoretical, analytical, computational, comparative or interdisciplinary research concerning digital processes in the architectural domain (topic to be approved by departmental jury). The process would consist of choosing of an area of interest/challenge, phasing out primary studies, clarifying intent, identifying methodologies to approach and achieve the intent, exploring ways of primary data collection (reading, first hand studies, experimentation, documentation, computation, programming, digital analysis tools, interviews and so on), structuring the information, analyzing and interpreting it, and finally concluding with well-argued inferences. The dissertation should serve to concretize notions

and ideas relating to digital architecture and/or the concerns and challenges of architecture and design in today's digital world.

The study must comprise of an aim, the objectives, the scope and limitations of their dissertation, hypothesis (if any), methodology followed by extensive review of literature and case studies through references and documentation. The analysis of the work must be substantiated either parametrically, empirically or through extensive arguments. A dissertation could serve as a prelude to the Thesis preparation and gives the student scope for independent study and opportunity to explore specific area of interest which will form the basis of his/ her design thesis project in the next semester. The topic will have to be approved at the start of the semester and the progress of work will be reviewed periodically, culminating in a viva-voce to a jury at the end of the semester.

TOTAL: 90 PERIODS

OUTCOME

- A Dissertation book which is based on accepted norms of technical writing.
- An understanding leading to formation of thesis ideas.
- Ability to carry out independent research and develop an understanding leading to formation of thesis ideas.

REFERENCES:
1. Borden, Ian and Kaaterina Rue diRay. The Dissertation: An Architecture Student's Handbook. Oxford: The Architectural Press; 2006
2. JA Smith, P Flowers, M Larkin. Interpretative Phenomenological Analysis: Theory, Method and Research (English) FIR Edition. New Delhi: Sage Publication, 2009.
3. W Creswell, John. Research design: Qualitative, Quantitative and Mixed Methods Approaches. New Delhi: Sage Publications, 2011.
4. Groat, Linda and Wang, David. Architectural Research Methods – 2nd edition. Hoboken: John Wiley & Sons Inc., 2013.
5. Ranjith Kumar, Ranjit. Research Methodology- A step by step guide for beginners-3rd Edition. New Delhi: Sage Publications, 2011

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	1	3	2	3	2	3
02	CO2	2	3	2	3	2	3
03	CO3	2	3	-	-	3	3
	AVERAGE	**1.7**	**3**	**2**	**3**	**2.3**	**3**

DG4312   DIGITAL STUDIO III : URBAN COMPUTATIONAL DESIGN   L T P/S C
0 0 10 10

OBJECTIVE
- To facilitate students towards exploring new limits and possibilities of urban interventions and place making in the digital age.
- To analyze technology-society transect and corresponding shifts in place-realm and identity, resource based and infrastructural urbanism, new typologies etc.
- To employ data analysis, visualization and flexible-scalable frameworks of generative design to augment multi-layered and collaborative urban design process

COURSE CONTENT

Students will explore the transect of technology, society and cities, in flux and the multifold prospects that arise from contemporary urban condition and aspirations. They will study global and local urban design parameters and their effect on a selected area of study.

Students will employ cartography data mapping, analysis and visualization as basis for a layered collaborative design and analysis framework. They will combine ground mapping with stakeholder's analysis, demographic study, climate studies, socio-economic analysis and wide range of urban design parameters. They will develop a system based approach for generating, evaluating and evolving multiple design solutions and development scenarios. They will employ generative and algorithmic models that might include (but not limited to) voronoi, cellular automata, fractals and L systems, neural networks, genetic algorithm etc.,

Probable projects might include place making in the digital era, urban networks and resources, eco urbanism, big data, IoT and urban form, digital and virtual urban experience, social media and the city, virtual public participation platforms and 'up-stream' public engagement with technology.

TOTAL: 150 PERIODS

OUTCOME
- An understanding of technology and society interaction, global urban shifts and concurrent local transformation of places
- Develop theoretical framework and technical skill sets to facilitate and propose responsive urban environments.
- Ability to acquire requisite skill-sets to be effective stake holders in the digital age and the means to use generative and algorithmic design for collaborative design process.

REFERENCES
1. Stimmel, Carol. Building Smart Cities: Analytics, ICT, and Design Thinking. Abingdon-On-Thames: Auerbach Publications 2015
2. Calthorpe, Peter. Urbanism in the age of Climate Change. Washington DC: Island Press, 2011 Long, To introduce the challenges of Digital architectural practice.
3. To enable Ying and Zhang, Enjia. Data Augmented Design: Embracing New Data for Sustainable Urban Planning and Design (Strategies for Sustainability). Springer, 2020
4. Maibritt Pedersen Zari, Regenerative Urban Design and Ecosystem Biomimicry. New York: Routledge Research in Sustainable Urbanism, 2019
5. Verebes, Tom (2014); Master planning the Adaptive City: Computational Urbanism in the , Routledge; Twenty-First Century.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	3	2	3	3	1
02	CO2	3	2	1	1	3	1
03	CO3	3	2	2	3	3	3
	AVERAGE	3	2.3	1.7	2.3	3	1.7

DG4313   **INTERNSHIP TRAINING**   **L T P/S C**
                                                                             X X X 2

OBJECTIVE
overall understanding of different stages in real life Digital architectural projects inpractice.
- To create involvement in these stages as much as possible within the scope of contemporary architectural practice - initiation of project, development of concepts into schematic drawings, approval process, presentations and working drawings, involvement in office discussions and client meetings, integrating structural and service concerns, estimation and tendering processes, site supervision and coordination in the construction process.

COURSE CONTENT

The Practical Training would be done in offices / firms practising Digital techniques/processes in India empanelled by the Institution in which the principal architect is registered with the Council of Architecture if the firm is in India or in an internationally reputed firm established abroad. The progress of practical training shall be assessed periodically internally through submission of log books along with work done by the students in terms of drawings, reports, etc., along with the regular progress report from the employers.

The students would be evaluated based on the criteria related to their contribution in the office some of which are given below.

- Understanding and involvement in the Contemporary process of architectural practice as mentioned in the objectives within the scope of the specific office in which training is undertaken.
- Adherence to time schedule, overall responsibility and professional conduct.
- Ability to carry out the instructions on preparation of schematic drawings, presentation drawings, working drawings and skill in this regard.
- Ability to work as part of a team in an office and contribute to related activities.
- Ability to participate in client meetings and discussions.
- Involvement in supervision at project site.
- Involvement/ initiative/ participation in any other aspects during the course of the training.

At the end of the Practical Training, a portfolio of work done during the period of internship along with certification from the office has to be submitted for evaluation through a viva voce examination.

OUTCOME

- Ability to understand the overall idea of the nuances of architectural practice.
- An understanding about the total process including contemporary design methodologies that goes into the making of a building.
- Maturity in using the experience gained from internship in future academic projects, beingableto effectively translate ideas into reality.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	-	3	-	2	-
02	CO2	1	1	3	3	1	3
	AVERAGE	2	1	3	3	1.5	3

SEMESTER IV

DG4411   **THESIS PROJECT**   L T P/S C
                                                                    0 0 20 20

OBJECTIVE

- To integrate knowledge gained in previous semesters with respect to issues/ tools of Digital Architecture.
- To understand and identify issues appropriate to a particular project or area of concern, through independent thinking and digital tools.
- To enable students project design solutions through computational, parametric, generative and/or algorithmic methodology.

COURSE CONTENT

The students will synthesize the areas of knowledge, skills and techniques acquired in the various courses of the previous semesters through a thesis project of their choice. This thesis project would be concerned in the realm of digital explorations of architectural design with a strong research component. The project would desirably extend the critical position and computational theories and tools developed within the theory and studio projects as well as dissertation. Thesis projects can include but are not limited to research and application of computational models, prototyping, audit tools for building performance, generative systems for design automation, parametric design application in the realm of architecture, BIM, workflows, embedding computational design in practice, advanced algorithmic frameworks, additive manufacturing, IOT building systems and management. The process would culminate in design interventions at scales appropriate to the topic. The project shall desirably have the potential to serve as a starting point for practice and/ or further research.

Students will submit a detailed proposal on their topic of interest(s). The Proposal shall be approved by the thesis review committee. The thesis project will be reviewed periodically by the review committee. At the end of the semester, the final thesis will be submitted and presented through a viva voce examination before a jury.

TOTAL: 300 PERIODS

OUTCOME

- Ability to integrate various contemporary/ advanced issues and techniques into the Digital Architectural process.
- Knowledge to identify and go in depth into specific and appropriate aspects relating to the realm of Digital Architecture.

REFERENCES

1. Contemporary Architecture and the Digital Design Process, Peter Szalapaj, Architectural Press.
2. From control to design: Parametric/algorithmic architecture. Barcelona, Spain: Actar. Meredith, M., Aranda, B., Lasch, C. &Sasaki, M. (Eds.). (2008).
3. Techniques and technologies in morphogenetic design (Architectural Design). Hoboken, NJ: John Wiley & Sons, Inc.
4. 4D space Interactive Architecture, Architectural Design, Lucy Bullivant, John Wiley & Sons, Inc.
5. Phylogenesis: FOA's Ark, Foreign Office Architects, FarshidMoussavi, Alejandro Zaera, Sanford Kwinter, Foreign Office Architects, Albert FerreLosa and Michael Kubo.
6. The Autopoiesis of Architecture, Volume I: A New Framework for Architecture, Patrick Schumacher, Wiley

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	3	3	3	3	3
02	CO2	-	-	3	3	3	3
03	CO3	-	3	3	3	3	3
	AVERAGE	3	3	3	3	3	3

PROFESSIONAL ELECTIVE I

UR4071   **CULTURE OF PUBLIC SPACES**   L T P/S C
                                                                             3 0   0   3

OBJECTIVES

- To understand the role of art in articulating city culture.
- To understand Cultural memory and art form associations in cities
- To understand the way public spaces in Indian cities have been used, appropriated and conceived.
- To understand the role of art in altering meanings and perceptions of public spaces

UNIT I   PRODUCTION OF SPACES – PUBLIC SPACE   9

Space: relative and absolute space, production of space in books, movies and literature. Definitions of public spaces, history of public spaces, typologies and characteristics of public spaces: parks, streets, plazas, Indian bazaars, etc.

UNIT II   CITY, MEANINGS AND MEMORY   9

Regeneration, culture and the city. Understanding urban popular cultural influences: Traditions – folklore - histogenesis. Urban landscape as public history. Formation of public space: power, resistance and meaning.

UNIT III   PERFORMITIVITY AND TEMPORALITY IN SPACES   9

Everyday activities in the city: space, body, signs, rituals. Art and the city: role of art festivals in cultural shifts. Religion, ritual space, festival and spectacle in the city. Case studies of Kala ghoda festival, Pongal fairs and festivals, arupathumoovar, santhanakoodu and velankanni chariot festival.

UNIT IV   ACTIVISM AND PUBLIC SPACES   9

Theory of democratic public spaces: democratic theory, democratic performances. Theorizing and evaluating public spaces: place and politics, democratic assemblies, protests and the public sphere, city and its representative space. Global case studies of urban space, protests and activism

UNIT V   CONSUMPTION OF URBAN SPACES   9

Visual, sensory and experimental consumption of urban spaces. Digital culture and virtual consumption of spaces. Branding of cities and their urban spaces. Case studies of Shanghai, Time Square, Paris, Marina beach, George Town, Chennai.

                                                                  TOTAL: 45 PERIODS

OUTCOMES

At the end of the semester, students will be able to:
- Understand the role of art in city culture, its perceptions and the collective memory.
- critically evaluate contemporary public space from theoretical, social, experiential and everyday perspectives and conceptualize alternate narratives
- Communicate their ideas about public space effectively using a variety of means such as writing, speaking and multimedia presentations.

REFERENCES
1. Ritzer, George. Postmodern Social Theory. Beijing: Beijing da xuechu ban she. 2004
2. Sadler, Simon. Situationist City. Cambridge: MIT PRESS,1998.
3. Storey, John. Cultural Theory and Popular Culture: An Introduction. Abingdon-On-Thames: Routledge, 2018.
4. Neal, Zachary "Locating Public Space" in Antony Orum and Zachary Neal, Eds. Common Ground? Readings and Reflections on Public Space, New York: Routledge, 2010

5. Lefebvre, Henri. Toward an Architecture of Enjoyment. Minneapolis: University of Minnesota Press, 2014.
6. Harvey, David. Spaces of Hope (California Studies in Critical Human Geography). Berkeley: University of California a Press, 2000

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	2	2	-	-	2	-
02	CO2	2	2	-	-	1	-
03	CO3	1	2	-	-	2	-
04	CO4	1	2	-	1	1	-
	AVERAGE	1.5	2	-	1	1.5	-

DG4001   ADVANCED GRAPHICS AND INTERFACE ARCHITECTURE   L T P/S C
3 0 0 3

OBJECTIVE
- To provide students with the knowledge on user interface and graphics design.
- To enable understanding of human interface, digital imagining and production.

UNIT II NTRODUCTION TO ADVANCED GRAPHICS AND INTERFACE ARCHITECTURE   9
The fundamentals of user experience and user interface design, with an emphasis on: the design of interactive user experiences and interface systems for effective and meaningful computer-human interaction: and the use of digital tools for asset creation. Projects focus on the structural, informational, and psychological aspects of interactive design, as well as asset design and creation.

UNIT II   GRAPHICS DESIGN AND ILLUSTRATION   9
Advanced work with images, headlines, text and graphs in single and multi-page publications as well as three dimensional layouts. a. Advanced problem solving methods b. Corporate and commercial graphics c. Advanced use of layout design software. Advanced layout methods.
Illustrations in design work and criteria for selecting the most effective style. Students plan and work up rough concept drawings before executing the final work. a. Advanced use of vector based illustration program b. Package design c. Digital illustration

UNIT III   MEASURING SYSTEMS   9
Measuring methods used in the graphic arts and printing industries. a. Picas, Points and Agates review b. Halftones measurements review c. Scaling d. Aspect ratios e. Pagination and in-position.

UNIT IV   TYPOGRAPHY   9
Typography as an essential component of any design project. Exploring creative ways to use typography in design work. a. Typographical poster design b. Signage c. Font design.

UNIT V   DIGITAL IMAGING AND PRODUCTION   9
Exploring creative ways to use the digital imaging software. a. Work in grey scale or sepia tone modes b. Product and portrait photography techniques c. Create special effects images d. Set up a digital portfolio e. Advanced use of digital imaging software. Production process involved in reproduction of a graphics file into a publication. a. Troubleshooting prepress files b. Printer's instructions c. interpreting printer's marks d. Evaluating proofs and print work e. Troubleshooting press operations

TOTAL: 45 PERIODS

OUTCOME
- Ability to understand Graphic Design and Interface Architecture.
- Knowledge of and perform tasks representative of technology - based careers, including art director, graphic designer, illustrator and digital artist.

REFERENCES
1. Wilbent. Galitz "The Essential Guide to User Interface Design", John Wiley &Sons, 2001.
2. James Craig, Designing with Type, 5th Edition: The Essential Guide to Typography, Watson-Guptill, 2006
3. Stephen Coles, The Anatomy of Type: A Graphic Guide to 100 Typefaces, Harper Design, 2012
4. Ellen Lupton, Thinking with Type, 2nd revised and expanded edition: A Critical Guide for Designers, Writers, Editors, & Students, Princeton Architectural Press, 2010
5. Adobe Creative Team, Adobe Creative Suite 6 Design & Web Premium Classroom in a Book, Adobe Press, 2012

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	1	3	-	1	3	-
02	CO2	1	3	-	-	2	1
	AVERAGE	1	3	-	1	2.5	1

DG4002 **DIGITAL MEDIA** **L T P/S C**
3 0 0 3

OBJECTIVE
- To enable students to understand the integration of Art with Technology
- To give students a perspective on the history of interactive and digital art.

UNIT I   HISTORY OF ART AND TECHNOLOGY   9
The use of tools, new materials, processes of production, mass communication, new products, inventions, and applications that were originally envisioned to be utilized in an industrial society and how they are now applied in the creation of artwork. Impact that artists have made on the technical world, particularly through the disciplines of printmaking, photography, film, and digital visualization

UNIT II   CONTEMPORARY ART IN CONTEXT   9
Digital art culture, present and happening. Case Studies of Artists and designers who are actively working with the latest technologies.

UNIT III   INTERACTIVE ART AND INSTALLATION   9
Interactive art and its meaning. Theoretical and practical perspective of interactive art. Purpose and language of art, creative practices, the appropriation of new technologies, social relevance, common artistic themes, and the response and involvement of audiences.

UNIT IV   COMPONENTS OF AN INTERACTIVE INSTALLATION   9
Introduction to hardware and software components of an installation. Sensors and mobile devices as Input. Microcontrollers for processing. Digital Media as Output.

UNIT V   BEYOND INSTALLATIONS   9
The emergence of Collaborative Design. Encounter and engagement around Urban Installations. Behavior Pattern and social interaction.

TOTAL: 45 PERIODS

OUTCOME
- Ability to understand the creative and technical process in projects involving art and technology.

REFERENCES
1. Christiane Paul, Digital Art, 3rd ed. London; Thames & Hudson, 2015
2. Melissa Gronlund, *Contemporary Art and Digital Culture (London; Routledge, 2017).*
3. Jay David Bolter, The Digital Plenitude: The Decline of Elite Culture and the Rise of New Media (Cambridge, MA; MIT Press, 2019).
4. Hannes Leopoldseder, Christine Schöpf, Gerfried Stocker, ed., Ars Electronica 2018, Festival for Art, Technology, and Society, Berlin: Stuttgart; HatjeCantz, 2018
5. Oliver Grau ed., *Museum and Archive on the Move: Changing Cultural Institutions in the Digital Era*, Berlin; De Gruyter, 2017.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	-	-	3	-	1
02	CO2	2	3	-	2	-	-
		3	-	-	2.5	-	1

MH4073 **SOFT SKILLS** **L T P/S C**
2 0 1 3

OBJECTIVES:
- To give introduction to the soft skills and personality
- To give understanding of and enable better interpersonal communication.
- To apprise of aspects of organizational communication and develop skill in it.
- To enable skill in reading and writing.

UNIT I   INTRODUCTION TO SOFT SKILLS AND PERSONALITY   9
Introduction to Soft Skills. Understanding of self. Self-awareness, self- management and Self Development. Values. Attitude. Positive Thinking and optimism. Confidence and excellence. Developing perception. Patience, persistence and flexibility. Empathy and Emotional Intelligence. Types of stress and stress management. Time Management and overcoming procrastination. Career planning.
Exercises and case studies for the various topics.

UNIT II   INTERPERSONAL COMMUNICATION   9
Classification and types of Communication. Verbal and non-verbal communication. Formal and informal communication. Barriers in communication.
Listening Skills, Types of Listening. Enhancing listening. Understanding context of words.
Responding. Speaking. Self development through speaking.
Nonverbal Communication. Body language and etiquette. Proxemics. Understanding of cultural, social and economic diversity and adapting to others.
Exercises and case studies for the various topics.

UNIT III   ORGANISATIONAL COMMUNICATION   12
Group Communication. Organisational Communication. Communication Breakdown. Conflict Management. Negotiation Skills.Meeting Management. Team Building and Team work. Leadership Skills. Emotional intelligence. Critical Thinking.

Speeches and debates, Combating nervousness and anxiety, Patterns and Methods of Presentation, Oral presentation- Planning and preparation, Making effective presentation. Speaking for various occasions at different scales. Public speaking. Group Discussions.
Exercises for the various topics.

UNIT IV ADVANCED READING AND WRITING SKILLS 15

Critical reading and understanding. Reviewing articles and books. Technical explanatory writing. Report writing for project. Structure of scientific/ technical papers. Writing papers for journals and conferences.
Assignments for the various topics.

TOTAL:45PERIODS

OUTCOME
- Awareness of importance of soft skills.
- Knowledge and skill in interpersonal communication.
- Knowledge and skill in organisational communication.
- Competency in reading and writing.

REFERENCES
1. Soft Skills, K.Alex, S.Chand, 2010
2. Soft Skills, Hariharan S, Sundararajan N, Shanmugapriya S.P, MJB Publishers 2010.
3. The ACE of Soft Skills, Gopalaswamy Ramesh, Mahadevan Ramesh, Pearson 2010.
4. Understanding Interpersonal Communication, Richard West and Lynn H.Turner, Cengage Learning, 2010.
5. Interpersonal Communication, Steven A. Beebe, Susan J. Beebe, Mark V. Redmond, Pearson 2011.
6. Business Correspondence & Report Writing, R. C. Sharma , Krishna Mohan,Tata McGraw Hill, 5th Edition 2017
7. How to Research and write a scientific paper, Robert A. Day, Barbara GasteCambridge University Press 2012.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	2	-	2	-	3	3
02	CO2	1	-	1	-	2	3
03	CO3	-	1	3	2	3	3
04	CO4	-	1	3	3	3	2
	AVERAGE	1.5	1	2.3	2.5	2.8	2.5

PROFESSIONAL ELECTIVE II & III

UR4191 **SOCIAL THEORY AND THE CITY** **L T P/S C**
3 0 0 3

OBJECTIVES
- To give critical understanding of the city and its underlying forces though various social theories
- To give awareness of urban processes through political, economic, social and cultural lenses.
- To give knowledge about the role of people and culture in city identity.

UNIT I   CITY, CULTURE AND ITS IDENTITY   9

Understanding city culture. Theories of Socio-cultural memory. Understanding visual culture. Urban and cultural anthropology. Contemporary Urban issues. City and Identity. Theories of Margaret Mead, Levi Strauss, Saskia Sassen, Claire Cooper Marcus, MSS Pandian, Malcom Adiseshaiah and Arjun Appadurai.

UNIT II   HISTORIOGRAPHY AND THE CITY   9

Understanding authorized and subaltern histories of cities - society and cities in vernacular literature, folk tradition and popular art - post-colonial theories and histories of Indian Cities.

UNIT III   POWER AND RESISTANCE IN THE CITY SPACES   9

Understanding the concept of power and its space manifestation in cities. Historic Indian Treatises: Chanakya Neeti, Harshacharitra, Ula, Uthirmerur inscriptions, Baburnama, Ain-i-Akbari. Theories of Giddens, Aldo Rossi, Corbusier, Oscar Niemeyer, Foucault. Case studies from New Delhi, Istanbul, Los Angeles, Jerusalem, Shenzen

UNIT IV   URBAN POLITICS   9

City and its people. Cities and social theory: Marxism, public realm theory, difference theory, critical theory. Spatial-social justice in the city. Spatial inequalities and urban form. Neoliberalism and the city. Globalization and urban spatial politics. Theories of Jane Jacobs, Pyatok, Newmann, SaskiaSassen. Case studies of Belfast, Berlin, Curitiba city, Caracas, Scandinavian cities, Mumbai -Lokhandwala region.

UNIT V   GAZE IN THE CITY   9

Space and body: The Flâneur, gaze and urban public spaces. Tourist gaze, gender gaze, colonial gaze. Sexuality in urban space: feminista, queer, transgender, etc.

TOTAL: 45 PERIODS

OUTCOMES

* An understanding of the city and its underlying forces though various social theories.
* Ability to process city through political, economic, social and cultural lenses.
* Ability to understand the city in terms of people, community & identity.

REFERENCES

1. Ritzer, George. Postmodern Social Theory. Beijing: Beijing da xuechu ban she. 2004
2. Sharp, Kristen, and Elizabeth Grierson. Re-Imagining the City: Art, Globalisation and Public space. Bristol: Bristol: Intellect Books, 2013
3. Phadke, Shilpa and Khan, Sameera. Why Loiter? New Delhi: Penguin India, 2011
4. Montgomery, Charles. Happy City: Transforming our lives through Urban Design. London: Penguin, 2015
5. Said, Edward. Orientalism: Western Conceptions of the Orient. London: Penguin Publication, 1978
6. Rapoport, Amos. The meaning of the built environment. Tucson: The University of Arizona Press, 1982
7. Rapoport, Amos. House, Form and Culture. London: Pearson Education, 1969
8. Srivastava A.R.N. Essentials of Cultural Anthropology. New Delhi: Prentice Hall India Private Ltd, 2005

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	-	3	-	3	-
02	CO2	3	-	2	-	3	-
03	CO3	3	-	2	-	3	-
	AVERAGE	3	-	2.3	-	3	-

UR 4072   **QUANTITATIVE TECHNIQUES AND DATA REPRESENTATION**   **L T P/S C**
                                                                            3 0 0   3

OBJECTIVES
- To acquire knowledge in statistical and numerical techniques and to take up quantitative analysis and research
- To provide in-depth understanding of various research methods in the field of planning and urban design

UNIT I   STATISTICAL METHODS   8
Data: Statistical and Numerical data. Types of data measurement scale – Nominal, ordinal, interval, ratio, Variables. Discrete, continuous- Data collection, coding and decoding, methods, tabulation and graphic presentation of data. Frequency distribution. Measures of central tendency: mean, median, mode. Measures of dispersion, Correlation and Regression. Introduction to spread sheets and statistical software – SPSS, Data Fit etc.

UNIT II   HYPOTHESIS TESTING   10
Sampling Distribution. Test based on Normal, t, Chi-square and F-Distributions. Discrete random variables, Completely Randomized Design. Randomized Block Design. Latin Square Design. ANOVA.

UNIT III   QUANTITATIVE TECHNIQUES IN PLANNING & DEMOGRAPHIC ANALYSIS   6
Elementary association models and decision making. Index numbers, weighted and un-weighted index numbers. Application of index number in spatial planning. Calculation techniques of vital events. Methods of demography and population studies, population projections, introduction to Census data and sampling Techniques.

UNIT IV   FORECASTING AND TIME SERIES ANALYSIS   9
Time series forecasting- line chart, curve fitting. Function approximation – approximation theory and numerical analysis, interpolation, extrapolation, pattern recognition, econometrics, segmentation, Uni-variate linear and nonlinear measures and bi-variate measures. Visualization Charts, Braided graphs, Line charts, Slope graphs, Gap Chart, Horizon graphs, reduced line chart (small multiples), Silhouette graph, Circular silhouette graph etc.

UNIT V   DATA REPRESENTATION   12
Data Ideograms and the Language of Symbols- Braille, Morse Code, Sign, and Gesture Data Abstraction, Task Abstraction, Common Visualization Idioms such as Bar Chart, Pie Chart and Coxcomb Plot, Line Chart, Area Chart etc., -Spatial data, networks, trees - Making Maps-encoding, Stacked & Grouped data, Manipulate View, Facet into Multiple Views, Case Studies in Visualization and Information tools

                                                                 TOTAL: 45 PERIODS

OUTCOMES
- The students will be exposed to data analysis techniques and will be equipped with necessary analytical skills to pursue quantitative research.
- The student will develop necessary skills to identify and interpret issues based on research inquiry methods.
- The student will learn how to write and publish research work in journals

REFERENCES
1. Agarwal B L. Programmed Statistics. New Delhi: New Age International Publishers, 2007
2. C. Acock, Alan. A Gentle Introduction to STATA. Revised Third Edition. 2012
3. Wooldridge. Introductory Econometrics: A Modern Approach. Noida: Thomson Press, 2011
4. F. Punch, Keith. Introduction to Social research: Qualitative and Quantitative Approaches. London: Sage Publications, 2013

5. 3. W Creswell, John. Research design: Qualitative, Quantitative and Mixed Methods Approaches. New Delhi: Sage Publications, 2011.
6. Evergreen, Stephanie DH. *Effective data visualization: The right chart for the right data*. New Delhi: Sage Publications, 2019.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	1	-	2	3	3	-
02	CO2	2	-	2	3	3	-
	AVERAGE	1.5	-	2	3	3	-

DG4003   USER INTERFACE AND USER EXPERIENCE DESIGN (UI / UX)   L T P/S C
                                                                       3 0 0   3
OBJECTIVES

- To acquire knowledge in User interface and user experience design and techniques and able to develop wire frames and prototypes.
- To provide in-depth understanding of role of human computer interactions.
- To gain basic design thinking knowledge into UX design and its research methods.

UNIT I   INTRODUCTION TO UXD   8
What is UX design, History and evolution of UX, connection between cognitive psychology and UX design, concept of human centered design process, components of UX design, difference between UX, UI and interaction design, introduction to basic laws in UX design, difference between web-based UI and phone-based UI.

UNIT II   UNDERSTANDING AND DEFINING A PROBLEM   8
Example of global UX projects worked and problems addressed, Practical exercise on Establishing design thinking into UX design, UX research methods (Contextual enquiries, ethnographic study, cultural probe, behavioral study, benchmarking etc.). Active immersion exercises reading a brief, problem identification and deriving of a problem statement basic overview of processes in UX design processes, conducting heuristic analysis

UNIT III   ANALYSING AND ESTABLISHING USER EMPATHY   10
Understanding human systems and Practical exercises on collaborative thinking (brainstorming, role-play etc.) Deriving practical user centric scenarios of existing problem and possible solutions to the problem through story boarding. Understanding user mind-set and establishing empathy (empathy mapping, user journey mapping etc). Deriving a strategic direction and plan of intervention areas, scope of interventions etc.

UNIT IV   INTRODUCTION TO IDEATION PROCESSES IN CONTEXT WITH USABILITY 9
Practical exercises on deriving of insights and conversion into user flows, Information architecture, wireframes and paper prototypes Introduction of Ui software (Figma / Adobe XD etc) Usability in interaction design, Introductions to Laws of UX design (Fitt's law, Law of proximity, Gestalt laws etc), Golden rules of usability in UI design, schneiderman's Eight golden rules, psychology and UX.

UNIT V   VISUAL DESIGN AND PROTOTYPING   10
Practical exercises in basics of Ui colour themes, Psychology behind colour themes, establishing aesthetic identity and theme relevant to context of the product, mood board generation and analysis. Incorporation of branding/ strategy theme into visual design. Generation of completed hi-fidelity prototypes.

TOTAL: 45 PERIODS

OUTCOMES

- Knowledge about user analysis techniques and the necessary analytical skills to pursue design thinking research.
- Ability to develop necessary skills to identify and interpret issues relating to, based on user research inquiry methods.
- Ability to develop wire frames and prototypes.

REFERENCES

1. Norman, D.A.: The Psychology of Everyday Things. Basic books, New York (1988)
2. Weinschenk, S. (2015). 100 more things every designer needs to know about people. New Riders.
3. User Interface Design: Bridging the Gap from User Requirements to Design. (2018). United States: CRC Press.
4. Hartson, R., Pyla, P. S. (2018). The UX Book: Agile UX Design for a Quality User Experience. Netherlands: Elsevier Science.
5. Quesenbery, W., Brooks, K. (2010). Storytelling for User Experience: Crafting Stories for Better Design. United States: Rosenfeld Media.
6. Szabo, P. W. (2017). User Experience Mapping. United Kingdom: Packt Publishing.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	-	-	-	3	-	3
02	CO2	3	3	1	3	-	-
03	CO3	3	3	2	3	-	-
		3	3	1.5	3	-	3

DG4004   **ADVANCED BIM AND BUILDING SERVICES**   **L T P/S C**
3 0 0 3

OBJECTIVE

- To enable students to understand HVAC strategies, building services, building management and building automation & networking.
- To provide knowledge on the BIM Software in design development, project and building management.

UNIT I   HVAC   9

Major Factors in HVAC Design – Ventilation, Duct Design, Heat Losses - Heat Gains. Methods of heating buildings, General procedure for sizing a heating plant. Methods of cooling and air conditioning, Sizing an Air-Conditioning Plant, Refrigeration. Cycles - Air-Distribution Temperature for Cooling, Condensers, Compressor-Motor Units. Cooling Equipment - Central Plant Packaged Units, Zoning, Packaged Air-Conditioning Units, Absorption Units for Cooling. Ducts for Air Conditioning, Built-Up Air-Conditioning Units. Variable Air Volume (VAV) Systems, Air-Water Systems. Control Systems for Air Conditioning. Heating and Air Conditioning. Industrial -Air Conditioning. Chemical Cooling, Year-Round Air Conditioning. Energy efficiency techniques in air conditioning. Air conditioning in IT environments, hospitals etc. Air conditioning for green buildings.

UNIT II   ELECTRICAL SERVICES   9

Electrical power – DC / Ac system, electrical load and emergency power, electrical conductors and raceways. Electrical distribution in buildings – Substations, substation equipment's. Power distribution system, standby and alternate power supply system. Light and sight – quality of light, lighting methods, daylight, system design of lighting. Measuring Light and Illumination –selection of recommended Illuminance, Zonal Cavity Method of Calculating Illumination. Lamp characteristics and Selection Guide. Impact of light on color. Integration of services. Electrical power monitoring– IBMS system.

UNIT III   BUILDING AUTOMATION AND NETWORKING   9

Introduction to building automation systems: components of BAS, HVAC, Lighting, electrical systems, water supply and sanitary systems, fire safety, security, communication and office automation system. Concept of Intelligent buildings. Integration of services, water pump monitoring & control. Control of Computerized HVAC Systems: Direct Digital Control, chillers, pumps, BTU monitoring & control. Data networking: IBMS system and its components, centralized control equipment's, substation and field controllers, field sensors.

UNIT IV   WORK FLOWS AND PROJECT MANAGEMENT   9

Introduction to softwares like spreadsheets, excel, etc. to determine workflow, materials inventory, human resource management, finance management, Primavera-P6/MS Project/Sure track-For schedule development and tracking of it; Prolog-Data Management-RFI's *Request for Information], Submittals-Product Data, Punch list etc.; JDE [JD Edwards]. Financial Management: For use of tracking and developing the cost reports and issuing the change orders, etc.; Navis works-In this software 3D Auto CAD/Revit model can be imported with a project schedule to review the progress of the Project.

Introduction to BIM Software application to simulate and analyze anticipation and ease of project delivery, the overall safety, etc. and to enhance efficiency during and post construction phases, and facility management. Applications like determination of quantities of items and material inventory, to build a building virtually prior to building it physically, work out problems, and simulate and analyze potential impacts, anticipation & ease of project delivery, overall safety of the project, etc.

UNIT V   BUILDING INFORMATION MODELLING (BIM)   9

Use of computers, Building information management of energy with environment aspects. Building information modelling (BIM): Facilitates documentation, design exploration, model-based quantity take off and estimating, interference checking, construction coordination and sequencing, digital fabrication and 3- D building information capture and visualization. Examine geometry, spatial relationships, building information, quantities and properties of building components. Integrating people, systems, business structures and practices for maximizes efficiency through all phases of design, fabrication, construction and life cycle of the structure.

TOTAL: 45 PERIODS

OUTCOMES

• Knowledge on BIM software to develop complex design solutions,
• Ability to enhance non-conventional creativity, for working on the technical aspects of architecture such as Structural Systems, Construction Technologies, Building Services, Detailing and Materials.
• Knowledge about exploring 2D, 3D and moving images for development and implementation of Design Ideas.

REFERENCES

1. Fred hall and Roger Greeno, Building Services Handbook, Routledge, 7th edition, 2013
2. BIS, National Building Code 2005, New Delhi, 2005
3. Shan Wang, Handbook of Air Conditioning and Refrigeration, 2n d Edition, McGraw Hill, 2000
4. Krieder, J. F., Handbook of Heating Ventilation and Air Conditioning, Taylor & Francis, 2005
5. Barrie Rigby, Design of Electrical Services for Buildings, 4th Edition, Routledge, 2013

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	-	3	2	-	-
02	CO2	-	-	3	2	-	-
	AVERAGE	3	-	3	2	-	-

DG4005   **MATERIALS AND TECTONICS IN DA**   **L T P/S C**
                                                                                   3 0 0   3

OBJECTIVE
- To introduce students to emerging innovative building materials.
- To enable understanding of production of SMART materials, their uses and its application.

UNIT I   INTRODUCTION   9
Introduction: Innovative Materials, Smart materials in Nature, Current Trends and Developments.

UNIT II   SMART MATERIALS AND TECHNOLOGIES I   9
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 color in response
to physical elements like light, temperature etc. ; Property Changing Smart Materials
Photochromic, Thermochromics, Electro chromics – Photo adhesives, Electro active Polymers,
Shape Memory Alloys

UNIT III   SMART MATERIALS AND TECHNOLOGIES II   9
Examine in depth, materials and technologies such as Energy-exchanging smart materials - Phase
change Materials (PCM) – Photo-luminescents, Photovoltaics, LED's, and Photoelectric,
thermoelectric, Piezoelectric, smart glazing, displays and interactive surfaces; and their
contemporary application in architecture.

UNIT IV   SMART MATERIALS AND TECHNOLOGIES III   9
Matter-exchanging smart materials, Gas/Water storing Smart Materials - Absorbent/Super
absorbent Polymers- Bio plastics

UNIT V   CASE STUDIES   9
Case Studies by Students on the innovative applications of Smart Materials in Design, to discuss
the methods of fabrication, production and construction for innovation in design.
                                                                          TOTAL: 45 PERIODS
OUTCOME
- Knowledge on the fundamentals and potentials of smart material and comprehensively
  analyze their current applications in architecture.
- Ability to focus on the smart material characteristics and explore different methods of
  material technology transfer to design, thereby inventing innovative approaches to design.

REFERENCES
1. Axel Ritter, *Smart Materials: In Architecture, Interior Architecture and Design*, Birkhauser, 2007
2. Michelle Addington and Daniel L.Schodek, *Smart Materials and Technologies in Architecture*,
   Architectural Press, Elsevier, 2004
3. Marinella Ferrara and Murat Bengisu, *Materials that Change Color: Smart Materials, Intelligent
   Design*, Springer, 2013

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	1	2	-	1	-
02	CO2	3	2	2	-	2	-
	AVERAGE	3	1.5	2	-	1.5	-

DG4006   **ADVANCED CODING FOR URBAN DESIGN**   **L T P/S C**
                                                                  1 0   2   3

OBJECTIVES
- To train students in using simulation and coding, to understand and re-imagine urban scenarios
- To familiarize students with complex automation algorithms in big data crunching and urban projections

UNIT I   URBAN DESIGN PRACTICES   10
Introduction to various issues and aspects that impinge on contemporary urban condition: globalization, digital revolution, contemporary processes, sustainability, splintering urbanism through changes in information and communication networks and transportation. Contemporary Processes in Urban Design. Place making in the Digital Age. Reconfiguring Public realm. Urbanization and Excursions on density. Case study / appraisal of an urban center / central business district / Town center in view of the above issues related to urban design.

UNIT II   ANALYTICAL TECHNIQUES, COMPUTER PROGRAMMING AND
                 INFORMATION SYSTEMS   12
Introduction to computers, concept of data management, flow-chart, introduction of programming languages. Delphi, Trade off-game, simulation models, gravity analysis, Lowry model, Threshold analysis, Multivariate analysis. Techniques of delineation of planning areas and planning regions. LanD use models. Optimization and economic analysis methods in project formulation and implementation- Project management software- Goal achievement matrix, Introduction to Cost-Benefit analysis - Application of computer in planning.

UNIT III   PARAMETRIC MODELLING   12
Parametric modelling for adaptive topographies, modularity, visualization of development codes, urban environmental modelling. Scripts for parametric algorithms. Interactive web applications. Additional functions for land use, FSI and density, plot coverage, optimization of building footprint.GIS appilcations

UNIT IV   BIM DATASETS   11
BIM datasets manipulation. Automate processes. Create links between multiple applications.
                                                    TOTAL: 45 PERIODS

OUTCOMES
- To learn to automate urban development scenarios
- To deploy algorithms and coding to propose innovative solutions in urban design

REFERENCES
1. Ayeni, Bola. Concepts and Techniques in Urban Analysis (Volume 17). Abingdon-On-Thames: Routledge, 2017
2. Tedeschi, Aruturo. AAD Algorithms-Aided Design: Parametric Strategies using Grasshopper. Paris: Le Penseur, 2014
3. Charytonowicz, Jerzy and Falcão, Christianne. Advances in Human Factors, Sustainable Urban Planning and Infrastructure: Proceedings of the AHFE 2018 International Conference on Human Factorsin Intelligent Systems and Computing). New York: Springer, 2018
4. William J. Mitchell, City of Bits: Space, Place and the infobahn,Cambridge: MIT PRESS, 1996.
5. Portmann Edy, Designing Cognitive Cities (Studies in Systems, Decision and Control Book 176) .New York: Springer, 2018

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	3	3	-	3	-	-
02	CO2	3	3	-	3	-	-
	AVERAGE	3	3	-	3	-	-

MH4074 **PSYCHOLOGYOFLEARNINGAND DEVELOPMENT** **L T P/S C**
3 0 0 3

OBJECTIVES
- To introduce general concepts of learning theory.
- To help understand research related to theories of learning.
- To enable opportunity to engage in critical analysis of theories through discussions.

UNIT I   INTRODUCTION   7
Introduction to learning. Behaviourism- Classical and Operant. Social Learning Theory. Taxonomies. Mastery Learning. Cognitive Information Processing.ProblemSolving,Transfer. Meaningful Learning. Situated Cognition.Developmentand Learning.Interactional Theories of Learning. Nature and Meaning of Psychology. Methods and Scope Psychology.

UNIT II   EDUCATIONAL PSYCHOLOGY   9
Nature and Meaning of Educational Psychology. Functions Educational Psychology. Physical, Social, Emotional and Cognitive development patterns. Stage.Specific Characteristics of Infancy and Childhood and their developmental tasks. Characteristics and Problems of Adolescents.Needs, aspiration, attitudesandSelf-concept of Adolescents. Guidance and Counselling for adolescents.

UNIT III   UNDERSTANDING LEARNER STAGES OF HUMAN DEVELOPMENT   9
Cognitive Development. The Self, Social, and Moral Development. Learner Differences and Learning Needs. Language Development. Language Diversity and Immigrant Education. Culture and Diversity, Behavioural Views of Learning. Cognitive Views of Learning.Complex Cognitive Processes.

UNIT IV   LEARNING AND MOTIVATION   11
Concept of learning and its nature. Factors influencing learning–Personal and Environmental. Motivation–Nature, Types.   Techniques of enhancing learner's motivation. Theory of Learning. Operant Conditioning theory of learning. Gestalt theory of Learning. Learning goal swith classroom activities, create motivating and inclusive environments, and integrating assessment into learning. Frameworks like Backward Design.Effective teaching and learning frameworks from psychological, cognitive, sociological,and educational research.

UNIT V   APPRECIATION AND CRITICISM   9
Ability of Understanding– appreciation ,advocatory, descriptive, evaluative, interpretative and other evaluation criteria and methodology .Development of Design Thoughts- understanding, developing and expressing a design thought in its right perspective purpose, manner and mode.Theoriesand models for experiencing architecture.

TOTAL: 45 PERIODS

OUTCOME
- Knowledge about major social and psychological processes involved in learning and development in an educational setting.
- Ability to engage in knowledgeable and productive dialogue with colleagues about human learning, development, and educational practice.

REFERENCES

1. EllenD.Gagne,CarolWalkerYekovich,FrankR.Yekovich,'The Cognitive Psychology of School Learning',Pearson,1997.
2. Derville,Leonore,M.T ,'TheuseofPsychologyinTeaching',LongmanLondon,1982.
3. Biggs, Jhon B,'TheProcess of Learning',PearsonHigher Education,1993.
4. McShane,J,'Cognitive Development, AnInformation Processing Approach Basic',Black Well,Oxford, 1991.
5. Glover, J.A and Bruning, 'Educational Psychology Principles and Applications, Pearson, 1990.
6. DececcoJ.P,'PsychologyofLearning and Instruction: Educational Psychology',Prentice Hall ofIndiaLtd, NewDelhi,1970.
7. Herbert J. Klausmeier, Richard E. Ripple, 'Learning and Human Abilities: Educational Psychology',Joanna CotlerBooks, 1975.
8. Carol Davidson Cragoe, 'HowtoReadABuilding',Rizzoli,2008.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	-	-	3	3	-	1
02	CO2	-	-	3	3	-	-
03	CO3	-	-	3	3	-	-
	AVERAGE	-	-	3	3	-	1

PROFESSIONAL ELECTIVE IV

DG4007   **ECOLOGY AND DIGITAL ARCHITECTURE**   **L T P/S C**
3 0 0 3

OBJECTIVES
- To enable students to understand nature inspired designs.
- To give students knowledge on bio mimicry architecture.
- To introduce students about the use of digital platforms for design development.

UNIT I   INTRODUCTION   9
Introduction to nature inspired design thinking principles and philosophies. Understanding earth operating condition. Patterns in nature, reconnect with nature. Biophilia. Life's unifying principles. Bio mimicry and architecture. Works and philosophies of Antoni Gaudi, Norman Foster, Michael Pawlyn.

UNIT II   DYNAMICS IN ECOLOGY   9
Introduction to Urban Eco-systems. Basis of environmental science. Ecology, Ecosystems, Habitat, structure of the ecosystem, major ecosystems, productivity of ecosystems adaptation Understanding ecological concept, regulation, carrying capacity, stability and resilience of ecosystem. Introduction to emergence in nature - self organization and complex systems in nature. Concept of Boids, understanding bionics and its implications in design.

UNIT III   BIOMIMICRY   9
Introduction to bio mimicry architecture – principles. Understanding Space creating, conditioning, structure, Energy and form. Understanding Natural form. Ecological systems. Biological strategies. Natural systems. Understanding Challenges and issues in Biology to Design.

UNIT IV   BIOMORPHISM   9
Emerging technologies and designs- towards a biological paradigm. Dynamics in biological systems. Environmental dynamics and computation. Understanding Fibers, Textiles, Nets, Lattices, Branches, Cells, Mass components and implications in design.

UNIT V   VISUAL SCRIPTING   9
Evolve concepts of Biomimicry and Biomorphism in architecture, simple scripting, visual coding and parametric design using BIM and other computational software.

TOTAL: 45 PERIODS

OUTCOMES
- Knowledge about the Dynamics in nature and ecosystem
- Ability to Design inspired through nature
- Ability to use parametric software to generate nature inspired design.

REFERENCES
1. Pawlyn, Michael. Biomimicry in Architecture, 2011.
2. Pérez, Eliezer, Amador. Biomimicry/Biomimetics in Architecture, 2014.
3. Ginatta, Carlos. Architecture without Architecture, 2010.
4. Cervera, Maria, Rosa, and Javier Gómez-Pioz. Bionic Architecture, 2015.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	-	2	3	-	3	-
02	CO2	-	-	1	3	2	-
03	CO3	-	3	2	2	3	-
	AVERAGE	-	2.5	2	2.5	2.7	-

DG4008   **BIO-MIMETIC ARCHITECTURE**   **L T P/S C**
                                                           3 0 0 3

OBJECTIVE
- To enable students to understand nature inspired designs.
- To give students knowledge on bio mimicry architecture.
- To introduce students about the use of digital platforms for design development.

UNIT I   INTRODUCTION   9
Introduction to nature inspired design thinking principles and philosophies. Understanding earth operating condition. Patterns in nature, reconnect with nature. Biophilia. Life's unifying principles. Bio mimicry and architecture. Works and philosophies of Antoni Gaudi, Norman Foster, Michael Pawlyn.

UNIT II   DYNAMICS IN ECOLOGY   9
Introduction to Urban Eco-systems. Basis of environmental science. Ecology, Ecosystems, Habitat, structure of the ecosystem, major ecosystems, productivity of ecosystems adaptation Understanding ecological concept, regulation, carrying capacity, stability and resilience of ecosystem. Introduction to emergence in nature - self organization and complex systems in nature. Concept of Boids, understanding bionics and its implications in design.

UNIT III   BIOMIMICRY   9
Introduction to bio mimicry architecture – principles. Understanding Space creating, conditioning, structure, Energy and form. Understanding Natural form. Ecological systems. Biological strategies. Natural systems. Understanding Challenges and issues in Biology to Design.

UNIT IV   BIOMORPHISM   9

Emerging technologies and designs- towards a biological paradigm. Dynamics in biological systems. Environmental dynamics and computation. Understanding Fibers, Textiles, Nets, Lattices, Branches, Cells, Mass components and implications in design.

UNIT V   VISUAL SCRIPTING   9

Evolve concepts of Biomimicry and Biomorphism in architecture, simple scripting, visual coding and parametric design using BIM and other computational software.

TOTAL: 45 PERIODS

OUTCOMES

- Knowledge about the Dynamics in nature and ecosystem
- Ability to Design inspired through nature
- Ability to use parametric software to generate nature inspired design.

REFERENCES

1. Pawlyn, Michael. Biomimicry in Architecture, 2011.
2. Pérez, Eliezer, Amador. Biomimicry/Biomimetics in Architecture, 2014.
3. Ginatta, Carlos. Architecture without Architecture, 2010.
4. Cervera, Maria, Rosa, and Javier Gómez-Pioz. Bionic Architecture, 2015.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	-	1	3	3	2	-
02	CO2	-	-	3	3	2	-
03	CO3	-	1	3	3	-	3
		-	1	3	3	2	3

DG4009   **ADVANCED STRUCTURES AND MODULAR SYSTEMS**   **L T P/S C**
                                                                      3 0 0 3

OBJECTIVE

- To enable students in understanding the advanced structural systems.
- To introduce students to the modular construction technique.

UNIT I   INTRODUCTION   8

Understanding various structural systems and structural mechanism of complex systems-Wind and earthquake resistant building design, Advanced structural systems and construction systems. Overview of design philosophy and selection of the structural systems for tall buildings; criteria and loadings; Gravity load resisting systems, Lateral load resisting systems.

UNIT II   DESIGN PRINCIPLES   7

Design criteria for structural members and foundation- Codal provisions. Earthquake resistant building design. Introduction and Importance of earthquake resistant design: Fundamentals of the earthquake resistant design of engineering structures. Structural modelling and analysis.

UNIT III   ADVANCED STRUCTURAL SYSTEMS   9

Properties, Application, specifications and standards (Indian and International). Shell Structure, Domes, Space frames, shell barrel vault, folded plates, tensile structure and pneumatic structure – working details. Sequence of erection and facilitating maintenance of such structures. Understanding specialized equipment's.

UNIT IV   MODULAR COORDINATION   9
Materials - Modular co-ordination, standardization and tolerances-system for prefabrication. Pre-cast concrete manufacturing techniques, Moulds –construction design, maintenance and repair. Pre-casting techniques - Planning, analysis and design considerations - Handling techniques - Transportation Storage.

UNIT V   DIGITAL FABRICATION   12
Study of various industrial mass production systems - CNC cutting and milling (for mass customization) - Laser Cutting - 3D printing (SLS & FDM) & 3D Scanning - 3Axis CNC cutting & milling on non-planar surfaces. Digital & analogue experiment on various materials and their challenges. Best practices on the same.

TOTAL: 45 PERIODS

OUTCOME
- Knowledge about modular construction techniques.
- Ability to understand various structural and design principles
- Knowledge to analyse through various case examples.

REFERENCES
1. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001.
2. N.D. Kaushika, Energy, Ecology and Environment, Capital Publishing Company, New Delhi.
3. John Fernandez, Material Architecture, Architectural Press, UK.
4. Borden, G P. Matter: Material Processes in Architectural Production. Routledge, 2014.
5. Lindsey, B. Digital Gehry: Material Resistance Digital Construction. Birkhäuser Basel, 2001.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	-	3	-	3	3	-
02	CO2	-	3	-	3	-	-
	AVERAGE	-	3	-	3	3	-

MH4075	THEORY OFARCHITECTURAL EDUCATION	L T P/S C
		3 0 0 3

OBJECTIVE
- To give familiarity about theories of architectural education.
- To introduce the idea of cognition development.
- To give familiarity about ways of thinking and learning with respect to architecture.

UNIT I   INTRODUCTION   7
Overview of the important aspects of the discipline of architecture. Nature of Architectural Education based on the nature of the discipline of architecture.

UNIT II   TOOLS/TECHNIQUES TO TEACH ARCHITECTURE   9
Models and methods of Teaching. Teaching Aids In Architecture Education. Types of Teaching Aids-Visual ,Audio ,etc., Learning by Doing, reflection, exploring, arguing, incidentally. Case-Based Teaching. Advanced Organizer, Concept attainment model, Simulations.

UNIT III   SYNECTICS AS A MODEL OF TEACHING.   9

The essence of creativity in synectics. Use of synectics in the design studio. Techniques of teaching-learning: Maxims of teaching and its application to subjects of architecture. Concept mapping, creating concept maps. Basic aspects of classroom management.

UNIT IV   STUDENT DEVELOPMENT   11

Need of development. Cognitive Development. Connection between seeing and remembering. Memory Retention. Attention Span. Organizing Communication. Comprehension. Create a Focal Point. Evolution of technology in education. Testing of module/ survey conducted.

UNIT V   LEARNING IN ARCHITECTURE DESIGN STUDIO   9

Development of Critical, Creative and Pragmatic Thinking in Architectural Design Studio. Bloom Taxonomy in Design Studio. Qualities which can be attained at various stages in Architectural Design Studio.

TOTAL: 45 PERIODS

OUTCOME

- Awareness of the importance of contextual excellence in architectural design and methods for the same.
- Knowledge about and ability to integrate interdisciplinary and cognitive aspects of learning, teaching and development.

REFERENCES

1. S.K. Mangal, 'Essential of Educational Technology', PHI Learning Pvt. Ltd., 2009.
2. Bruce Joyce, Emily Calhoun, MarshaWeils, 'Modelsof Teaching', Pearson,2014.
3. Klausmier, Ripple, 'Learning and Human Abilities' Harper and Row, NewYork, 1971.
4. Eames Charles,Ray,'AnEames Anthology', Yale University Press,2015.

SL.NO	COURSE OBJECTIVE(CO)	PROGRAMME OUTCOME (PO)					
		PO1	PO2	PO3	PO4	PO5	PO6
01	CO1	-	-	3	-	-	-
02	CO2	-	-	3	-	-	-
03	CO3	-	-	3	-	-	-
	AVERAGE	**-**	**-**	**3**	**-**	**-**	**-**

AUDIT COURSES

AX4091   **ENGLISH FOR RESEARCH PAPER WRITING**   **L T P C**
                                                                    2 0 0 0

OBJECTIVES
- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I   INTRODUCTION TO RESEARCH PAPER WRITING   6

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II   PRESENTATION SKILLS   6

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT III   TITLE WRITING SKILLS   6

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV   RESULT WRITING SKILLS   6

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V   VERIFICATION SKILLS   6

Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first- time submission

TOTAL: 30 PERIODS

OUTCOMES

CO1 –Understand that how to improve your writing skills and level of readability
CO2 –Learn about what to write in each section
CO3 –Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
3. Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

AX4092   **DISASTER MANAGEMENT**   **L T P C**
                                                                         2 0 0 0

OBJECTIVES

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I   INTRODUCTION   6

Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II   REPERCUSSIONS OF DISASTERS AND HAZARDS   6

Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III   DISASTER PRONE AREAS IN INDIA   6

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV   DISASTER PREPAREDNESS AND MANAGEMENT   6

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V   RISK ASSESSMENT   6

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

OUTCOMES

CO1: Ability to summarize basics of disaster
CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO5: Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCES

1. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep& Deep Publication Pvt. Ltd., New Delhi,2009.
2. NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'NewRoyal book Company,2007.
3. Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences And Reflections", Prentice Hall OfIndia, New Delhi,2001.

AX4093   **CONSTITUTION OF INDIA**   **L T P C**
                                                                              2 0 0 0

OBJECTIVES
Students will be able to:
- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution.

UNIT I   HISTORY OF MAKING OF THE INDIAN CONSTITUTION
History, Drafting Committee, (Composition & Working)

UNIT II   PHILOSOPHY OF THE INDIAN CONSTITUTION
Preamble, Salient Features

UNIT III   CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES
Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV   ORGANS OF GOVERNANCE
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V   LOCAL ADMINISTRATION
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT VI   ELECTION COMMISSION
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to:
- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING
1. The Constitution of India,1950(Bare Act),Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

| **AX4094** | **நற்றமிழ்இலக்கியம்** | **L T P C** |
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UNIT I   சங்கஇலக்கியம்   **6**
1. தமிழின்துவக்கநூல்தொல்காப்பியம்
   – எழுத்து, சொல், பொருள்
2. அகநானூறு (82)
   - இயற்கைஇன்னிசைஅரங்கம்
3. குறிஞ்சிப்பாட்டின்மலர்க்காட்சி
4. புறநானூறு (95,195)
   - போரைநிறுத்தியஔவையார்

UNIT II   அறநெறித்தமிழ்   **6**
1. அறநெறிவகுத்ததிருவள்ளுவர்
   - அறம்வலியுறுத்தல், அன்புடைமை, ஒப்புரவறிதல், ஈகை, புகழ்
2. பிறஅறநூல்கள்- இலக்கியமருந்து
   – ஏலாதி, சிறுபஞ்சமூலம், திரிகடுகம், ஆசாரக்கோவை
   (தூய்மையைவலியுறுத்தும்நூல்)

UNIT III   இரட்டைக்காப்பியங்கள்   **6**
1.கண்ணகியின்புரட்சி
   - சிலப்பதிகாரவழக்குரைகாதை
சமூகசேவைஇலக்கியம்மணிமேகலை
   - சிறைக்கோட்டம்அறக்கோட்டமாகியகாதை

UNIT IV   அருள்நெறித்தமிழ்   **6**
1. சிறுபாணாற்றுப்படை
   - பாரிமுல்லைக்குத்தேர்கொடுத்தது,
   பேகன்மயிலுக்குப்போர்வைகொடுத்தது,
   அதியமான்ஔவைக்குநெல்லிக்கனிகொடுத்தது, அரசர்பண்புகள்
2. நற்றிணை
   அன்னைக்குரியபுன்னைசிறப்பு
3. திருமந்திரம் (617, 618)
   - இயமம்நியமம்விதிகள்
4. தர்மச்சாலையைநிறுவிய வள்ளலார்
5. புறநானூறு
   - சிறுவனேவள்ளலானான்
6. அகநானூறு (4)   - வண்டு
நற்றிணை (11)   -நண்டு
கலித்தொகை (11)   - யானை, புறா
ஐந்திணை 50 (27)   - மான்
ஆகியவைபற்றியசெய்திகள்

UNIT V   **நவீனதமிழ்இலக்கியம்**   **6**

1. உரைநடைத்தமிழ்,
   - தமிழின்முதல்புதினம்,
   - தமிழின்முதல்சிறுகதை,
   - கட்டுரைஇலக்கியம்,
   - பயணஇலக்கியம்,
   - நாடகம்,
2. நாட்டுவிடுதலைபோராட்டமும்தமிழ்இலக்கியமும்,
3. சமுதாயவிடுதலையும்தமிழ்இலக்கியமும்,
4. பெண்விடுதலையும்விளிம்புநிலையினரின்மேம்பாட்டில்தமிழ்இலக்கியமும்,
5. அறிவியல்தமிழ்,
6. இணையத்தில்தமிழ்,
7. சுற்றுச்சூழல்மேம்பாட்டில்தமிழ்இலக்கியம்.

TOTAL : 30 PERIODS

தமிழ்இலக்கியவெளியீடுகள் / புத்தகங்கள்

1. தமிழ்இணையகல்விக்கழகம் (Tamil Virtual University)- www.tamilvu.org
2. தமிழ்விக்கிப்பீடியா (Tamil Wikipedia)-https://ta.wikipedia.org
3. தர்மபுரஆதீனவெளியீடு
4. வாழ்வியல்களஞ்சியம் - தமிழ்ப்பல்கலைக்கழகம், தஞ்சாவூர்
5. தமிழ்கலைக்களஞ்சியம் - தமிழ்வளர்ச்சித்துறை (thamilvalarchithurai.com)
6. அறிவியல்களஞ்சியம் - தமிழ்ப்பல்கலைக்கழகம், தஞ்சாவூர்