GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester - IV

Course Title: ARCHITECTURAL DESIGN – IV (HOUSING)
(Course Code: 41046301)

Diploma programme in which this course is offered	Semester in which offered
Architecture	Fourth

1. RATIONALE

Housing design is a multi-layered process which requires recall and application of knowledge of previously covered parameters of architectural design like form and space, spatial organization and relationships. It enables the students to independently undertake design of a large project and to handle a large site for designing. It also enables them to design a functional housing layout while simultaneously designing residential units on a given site with respect to climate, site topography, building bye-laws, hierarchy of spaces, etc. Knowledge of structure, building construction and building services is imparted in this semester which is applied by students while preparing individual housing unit designs as well as housing layout designs. During the entire design process, knowledge of different types of openings and their locations in a building with respect to interiors and climatology is also gained by the student which helps them design suitable architectural elements. Knowledge of design parameters, spatial order, structure as order and space–structure-form co-relation is also gained by continuous interaction with concerned faculty during the study of this course. Thus, designing a given housing project enables the students to learn and apply basic architectural designing skills related to residential unit designs as well as to developing a site layout. This course is designed in view of above outlook and for developing the competency mentioned below, accordingly.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop required skills in students so that they are able to acquire following competencies:

- **Prepare schematic housing design layout for locating and orienting the designed housing units with regard to site topography, site surroundings and climatic conditions with functional integration of landscaping.**
- **Prepare housing unit designs with complete set of presentation drawings based on given programme considering integration of interior spaces, lighting, ventilation, structure, materials of construction, building services, building byelaws and finishes.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with the identified competency are to be developed in the learner for the achievement of the following COs:

a) Collect and analyze primary and secondary data for a given housing project.
b) Prepare site layout plan of a given housing project.
c) Design different residential typologies of a given housing project.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical/Studio Marks		Total Marks
L	T	P/S	C	CA	ESE	CA	ESE	
0	0	12	6	00	00	100	100	200

*(*): For this practical/studio only course, 100 marks under the practical CA should be done by assessment of process of designing a mass housing with all design parameters. This is designed to facilitate attainment of COs holistically. Thus, this course should be considered as an **Applied 'Theory' Course** where the theory portion has to be taught during the practical/studio hours.*
***Legends: L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P/S**–Practical/studio; **C** – Credit, **CA** - Continuous Assessment; **ESE** -End Semester Examination.*

5. SUGGESTED PRACTICAL/STUDIO EXERCISES

The following practical outcomes (PrOs) are the sub-components of the COs. *They are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'*.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	**Collect Primary Data:** Collect data of an existing mass housing project like Circulation plan, Floor Plans, sections, elevations and furniture layout with indoor-outdoor connectivity, space organization etc. to an appropriate scale to analyze the same with design parameters, land-building relationship, environmental and energy efficiency concerns. **Collect Secondary Data**: Collect similar data of an existing mass housing project From Books, Magazines, Internet, etc.	I	12
2	Graphical analysis and comparison of similar type of Housing project with respect to all architectural design parameters like area, light ventilation, form, space, circulation, structure, skin and indoor-Outdoor connectivity. Preparation of pie charts, sketches and their appraisal. Then formulation of requirements for proposed design project.	I	12
3	Prepare flow diagram, conceptual drawing like sketch design, block models, floor plans, elevations, sections and Sketches of at least four different typologies of housing units and conceptual site layout with cluster plans for the given Housing Project with consideration of environmental and energy efficiency parameters. Also prepare block study models.	II	24
4	Prepare Set of preliminary presentation drawing of housing units and of site layout with road network, parking, landscaping and other site features based on the given requirements with considerations of principles of design, relationship between human feelings, culture and architectural form.	III	24

5	Develop the unit and site layout designs further and prepare detailed drawings of all floor plans with furniture layout, sections, elevations as well as detailed site layout with road network, common spaces, amenities, parking, services and landscaping.	IV	36
6	Prepare a set of final presentation drawings including all given design parameters in plans, sections and elevations for the designed buildings.	V	48
7	Prepare a model of the designed project to scale or create virtual 3D model in any 3D design software and Prepare rendered views of the designed building.	V	12
	Total Hrs.		**168**

Note

*i. More **Practical/Studio Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*

ii. Study report, data collection and analysis report must be assigned in a group. Teacher has to discuss about type of data (which and why) before group start their site visits.

*iii. The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical/Studio Exercises** of this course required which are embedded in the COs and ultimately the competency.*

Sr. No.	Sample Performance Indicators for the PrOs	Weightage in %
Assessment should be done on the basis of demonstration of,		
1	Skills	40
2	Learning Process	20
3	Communication	20
4	Learning Attitude	20
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to usher in uniformity of practicals in all institutions across the state.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Measuring Tape, Laser measure tape, etc.	1-7
2	Drawing Board (A1 size @ 23"X32") with other Instruments like Parallel, Set squares (45˚ and 30˚-60˚), Adjustable set square, Triangular scale, Tracing papers, Drawing Sheets, Model making set, etc.	1-7
3	Interactive board with LCD overhead projector	1-7
4	Desktop PCs with latest configuration (64-bit Intel, AMD or Equivalent multi-core processor, Minimum 8 GB RAM, Minimum	1-7

S. No.	Equipment Name with Broad Specifications	PrO. No.
	6 GB Dedicated Graphics Card)	

7. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs and PrOs. More could be added to fulfill the development of this competency.

a) Work as a leader/a team member.
b) Follow ethical practices.
c) Social and Functional Competence of design
d) Participates in class discussions and present the design effectively, Generate new ideals.
e) Practice environmentally friendly methods and design processes.

The ADOs are best developed through the laboratory/field based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy* that are formulated for development of the COs and competency. If required, more such UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit –I **Primary and Secondary Data collection**	**1a.** Collect/Prepare primary data of existing housing scheme like site layout , floor plans, sections, elevations, furniture layout and related drawings while secondary data from books, journals, magazines, internet, etc. **1b.** Graphically analyze collected data of existing housing scheme with respect to all architectural design parameters like area distribution, lighting & ventilation, form, space design, circulation, structure, façade and inter-connectivity. **1c.** Formulate design requirements for the given design project.	**1.1** Introduction to and study of existing group housing schemes/mass housing schemes of both private entrepreneurs/builders as well as company housing or government housing schemes. • **Primary data collection:** With the help of site visit/visits, existing public building, take measurements and prepared drawings, photos, sketches, etc. • **Secondary Data Collection**: Collection of data from books, magazines, internet, etc. **1.2 Formulation of requirements**

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit– II Development of Concept and Site layout	**2a.** Prepare conceptual alternatives and ideas considering various design parameters for further design development of housing units. **2b.** Prepare a functional land-building relationship diagram based on requirements for housing units. **2c.** Prepare a functional land-building relationship diagram based on given layout requirements. **2d.** Prepare a block study model of the designed housing unit as well as the site layout.	Design development of housing parameters **2.1** Housing unit designs of at least four different typologies and their location and orientation on site with regard to, ● Typologies e.g. twin houses, row houses, bungalow, low-rise /high-rise apartments or any other type. ● Margins as per prevailing building byelaws. **2.2** Housing unit layout with a functional land-building relationship – principles for creating a hierarchy of spaces, ● Site topography ● Site surroundings ● Climatic considerations
Unit – III Preparing Sketch Design	**3a.** Produce improved sketch design for housing units with regard to functional integration of interior spaces and other design parameters. **3b.** Produce improved sketch design for housing layout with respect to spatial ordering principles for the housing units and their layout on site.	**3.1** Housing unit design with respect to ● Lighting and ventilation ● Space ● Form ● Structure ● Materials of construction **3.2** Housing layout design with respect to**,** ● Hierarchy of spaces ● Spatial organization ● Pedestrian & vehicular movements
Unit – IV Design & Development of Drawings	**4a.** Prepare complete Housing site layout drawings with housing unit locations, roads, common spaces and amenities, parking and landscaping. **4b.** Prepare cluster plans for various typologies of housing units. **4c.** Prepare furniture layout drawings for the designed housing units of each individual category.	Design and Development of Drawings **4.1 Development** of floor plans with furniture, sections, elevations and spatial relationships at appropriate scale. **4.2 Development** of site layout with Cluster plans for various categories of housing units, road network and landscaping. **4.3 Development** of elevations and sections with respect to building finishes fenestrations and levels.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit – V Final Presentation of Drawings and Models	**5a.** Prepare a set of final presentation drawings including all of the above to a suitable scale. **5b.** Prepare physical or virtual models of the designed housing project to a suitable scale with surrounding.	**5.1 Final presentation** drawings with the application of knowledge of architectural rendering techniques gained in previous semester. **5.2 Preparation** of a model of the designed project to scale or create virtual 3D model in any 3D design software and prepare rendered views of the designed building.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Primary and Secondary Data collection	**Not Applicable**				
II	Development of Concept and Site layout					
III	Preparing Sketch Design					
IV	Design & Development of Drawings					
V	Final Presentation of Drawings and Models					
Total						

Legends: *R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)*

Note*: This specification table provides general guidelines to assist learners for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions to assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may slightly vary from above table.*

10. SUGGESTED LEARNER ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested learner-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Learners should perform following activities in group and prepare reports of about 5 pages for each activity. They should also collect/record physical evidences for their (learner's) portfolio which may be useful for their placement interviews:

a) Visits to Architecture degree/diploma institutes for studying and knowledge-sharing on documented/on-going students' 'Housing' design works.
b) Visits to practicing architects' offices and residential building townships, sites, etc. to study 'Housing' designs as well as for data collection.
c) Visits for studying 'Vernacular Architecture' existing in old city areas e.g. 'Pols' of Ahmedabad, Vohra Houses of Patan or that of any other city within the state. Also suggested is undertaking the 'Heritage Walk' etc. to study and understand vernacular housing typologies.

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (Course Outcomes in psychomotor and affective domain) so that learners are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of Programme Outcomes/Course Outcomes in affective domain as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that learners also acquire those Programme Outcomes/Course Outcomes related to affective domain.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) Guide learner(s) in undertaking micro-projects/time problems.
c) ***'L' in section No. 4*** means different types of teaching methods that are to be employed by teachers to develop the outcomes.
d) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the learners for ***self-learning***, but to be assessed using different assessment methods.
e) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
f) Guide learners on how to address issues on sketching, model making, etc.
g) Use relevant video/animation films to explain various concepts and processes related to basic Architectural design themes for Public Buildings.
h) Use different instructional strategies in classroom teaching.
i) Use the relevant architectural assignments in the given situation.
j) Guide learners on form, functions utility, method of construction, etc. to facilitate them to prepare actual measured drawings.
k) Use the technique of tabletop discussions along with design jury sessions to teach the relevant content to the learners.
l) Adopt various strategies to enhance each learner's individual creative ability especially with reference to concept and form

12. SUGGESTED DESIGN MICRO-PROJECTS/TIME PROBLEMS

Micro-Project:

Only one micro-project is planned to be undertaken by a learner that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based (group of 3 to 5).

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each learner will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The duration of the microproject should be about **14-16**

(fourteen to sixteen) learner engagement hours during the course. The learners ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-project is given here. This has to match the competency and the Co. Similar time problem could be added by the concerned course teacher:

a. Undertake an **Architectural Apprenticeship** to gain practical exposure of the actual on-going projects.
b. Undertake a design project in consultation with the teacher.

Time Problem:

The duration of the time problem should be about one or two days.
A suggestive list of time problem is given here. This has to match the competency and the CO. Similar time problem could be added by the concerned course teacher:

a. Design a unit typology for given site and as per requirements.
b. Design a cluster plan by using single or various typologies.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Principles of three Dimensional Design	Wucius Wong	New York, Van Nostrand Reinhold Co., 1977. ISBN : 0442295618 9780442295615 1 March 1977
2	Time Saver Standards for Architectural Design	Michael Crosbie), Donald Watson	McGraw Hill Education; ISBN-10. 9781259002892 ISBN-13. 978-1259002892 8th edition (1 July 2017)
3	Daylighting – Natural light in Architecture	Derek phillips	Architectural press An Imprint of Elsevier, Burlington ISBN 0750663235 First Publication 20041
4	Architecture - Form, Space & Order	Francis D.K.Ching	John Wiley & Sons, United States ISBN-10 : 047023153X ISBN-13 : 978-0470231531 3rd Edition Set (25 September 2007)
5	Neufert,Architects' Data	Ernst Neufert	Wiley-Blackwell, United Kingdom ISBN-10 : 111928435X ISBN-13 : 978-1119284352, 5th edition (12 July 2019)
6	housing & urbanisation	Charles Correa	Urban Design Research Institute, Bombay, India; First Edition (1 January 2000) ISBN-10 : 8190112805 ISBN-13 : 978-8190112802
7	The Housing Design Handbook: A Guide to Good Practice	David Levitt, Jo McCafferty	Routledge; 2nd edition (16 October 2018) ISBN-10 : 1138568953 ISBN-13 : 978-1138568952
8	The Modular Housing Handbook	Simon Bayliss, Rory Bergin	RIBA Publishing; 1st edition (1 Sep. 2020) ISBN-10 : 1859468659 ISBN-13 : 978-1859468654

S. No.	Title of Book	Author	Publication with place, year and ISBN
9	Social Housing: Definitions and Design Exemplars	Paul Karakusevic, Abigail Batchelor	RIBA Publishing; 1st edition (11 May 2017) ISBN-10 : 1859466265 ISBN-13 : 978-1859466261

14. SOFTWARE/LEARNING WEBSITES

- www.greatbuildings.com
- www.architecturalrecord.com
- www.archdaily.com
- www.dezeen.com
- www.archpaper.com
- www.architectmagazine.com
- www.archello.com

Suggestive list of 3D Design Software:

- SketchUp
- AutoCAD
- ArchiCAD
- Dynamo
- Rhinoceros 3D: Rhino+ Grasshopper
- Revit Architecture

15. PO-COMPETENCY-CO MAPPING

Semester V	Architectural Design – IV (Housing)(Course Code:4345001)								
	POs and PSOs								
Competency & Course Outcomes	**PO 1** Basic & Discipline specific knowledge	**PO 2** Problem Analysis	**PO 3** Design/ develop-ment of solutions	**PO 4** Engineer-ing Tools, Experimentation &Testing	**PO 5** Engineer-ing practices for society, sustain-ability & environ-ment	**PO 6** Project Manage-ment	**PO 7** Life-long learning	*** PSO 1** Planning & Design	**#PSO 2** Execu-tion
Competency	• **Prepare schematic housing design layout for locating and orienting the designed housing units with regard to site topography, site surroundings and climatic conditions with functional integration of landscaping.** • **Prepare housing unit designs with complete set of presentation drawings based on given programme considering integration of interior spaces, lighting, ventilation, structure, materials of construction, building services, building byelaws and finishes.**								
Course Outcomes a) Collect primary and secondary data for a given housing project.	2	2	-	1	3	2	3	1	3
b) Prepare Site layout plan of a given Housing Project.	3	2	3	2	3	-	2	3	3
c) Design different residential typologies of a given housing project.	3	2	3	2	3	-	2	3	3

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation of each CO with PO/PSO.*

***PSO 1: Planning and Design:** Prepare architectural designs and all types of drawings with appropriate material specifications and application techniques as per specific requirements of the project.

#PSO 2: Execution: Work competently as assistants in architectural firms so as to contribute and coordinate both office work and execution on site.

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

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