

PROGRAMME STRUCTURE
FOR
DIPLOMA PROGRAMME IN
ARCHITECTURAL ASSISTANTSHIP
UNDER RATIONALISED SEMESTER SYSTEM
(IMPLEMENTED FROM ACADEMIC YEAR 2020-2021)



BOARD OF TECHNICAL EDUCATION, GOA STATE

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Directorate of Technical Education, Goa State

DIPLOMA IN ARCHITECTURAL ASSISTANTSHIP

DIPLOMA IN ARCHITECTURAL ASSISTANTSHIP- CURRICULUM STRUCTURE

SEM -I			YEAR-I								
Semester	Code	Subjects	L	T	P	H	TH	TM	PR	TW	TOT
FIRST	GC101	Communication Skills	-	-	2	2	-	-	25	25	50
	AR101	Basic Architectural Drawing	-	-	6	6	-	-	50	50	100
	AR102	Building Carcass & Components	3	-	-	3	75	25	-	-	100
	AR103	Graphics-I	-	1	4	5	-	-	50	50	100
	AR104	Building Material-Construction	3	-	-	3	75	25	-	-	100
	AR105	Basic Model Making	-	-	2	2	-	-	25	25	50
	AR 106	Mathematics for Architecture	3	1	-	4	75	25	-	-	100
			9	2	14	25	225	75	150	150	600
L- Lecturers T – Tutorial P – Practical C-Credits TH – Theory Marks TM – Test Marks PR – Practical Marks TW- Term Work Marks											

1. COURSE OBJECTIVE:

The course aims to develop Communication skills in English by improving students' ability to write, speak, listen and read effectively. Emphasis is also laid on students' personality development, helping them to build their confidence in interpersonal / group communication.

2. TEACHING AND EXAMINATION SCHEME

Semester	I				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
GC101		L	T	P		TH	TM	TW	PR/OR	
		-	-	02	02	-	-	25	25	50

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

GC101.CO1 Understand the essentials of effective Communication.

GC101.CO2 Develop reading, writing, speaking, listening and effective presentation skills.

GC101.CO3 Select the appropriate mode of Communication.

GC101.CO4 Demonstrate reading, writing, speaking, listening and effective presentation skills.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	0	0	0	0	3	3	3
CO2	2	1	1	1	3	3	3
CO3	2	0	1	1	3	3	3
CO4	2	0	0	1	3	3	3

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Phr = Practical hours	CO = Course Outcomes		
Unit			Phr	CO
1 UNIT NAME: FUNDAMENTALS OF COMMUNICATION SKILLS				
1.1 Communication Skills fundamentals Definition, communication process, importance of Communication Skills, essentials of effective communication			01	CO 01 CO 02 CO 03 CO 04
1.2 Types of communication: Verbal Communication and nonverbal communication (body language, facial expressions, gestures, eye contact, posture, dress and grooming/personal appearance, deportment, personal hygiene) Paralinguistic (Volume, pace, pitch, pauses)			02	

Directorate of Technical Education, Goa State

1.3 Barriers to communication: Physical barriers, psychological barriers and cultural barriers	01	
2. Unit: PRESENTATION SKILLS		
2.1 Presentations: Methods and styles of presentation, importance, planning a presentation, venue selection, audience awareness (age, gender, profession, background, educational and social background), time and duration, audio visual aids (OHP, LCD projector, flip charts, white/black/green board, computer, microphone)	02	CO02 CO03 CO04
2.2 Public speaking: Preparatory steps, tips for good beginning and end, delivery style, techniques for a good speech (repetition, signs, pictures, humor), body language	02	
3 UNIT: TECHNICAL WRITING		
3.1 Report writing Functions and parts of a report, qualities of a good report and types: Report on any institute function, Accident report, Industrial visit Report	04	CO 01 CO 02 CO 04
3.2 Business letters Principles of effective letter writing, parts of a business letter, formats (Full block style, Semi block style, Modified block style) Routine/ Generic letters (letter to the heads of the institute, letter to the heads of various departments/sections of the institute) Types of letters: Enquiry Letter, Quotation, Purchase Order, Letter of Complaint	06	
3.3 Job application Tips for a good C.V and a Resume	02	
4 UNIT GRAMMAR		
4.1 Fundamentals of English writing Subject verb agreement, homonyms, homophones, homographs, articles, punctuation, synonyms, fundamentals of sentence construction	02	CO 01 CO 02 CO 04
4.2 Paragraph Writing: Developing Topics (the main idea), body (supporting sentences), conclusion, proof reading	02	
UNIT V: LANGUAGE WORKSHOP		
5.1 Reading Skills Strategies to use for building vocabulary and reading fluencies (read extensively, identify new words, use of dictionary, online dictionary apps), reading comprehension, pronunciation, debate, role play,	08	CO 01 CO 02 CO 04
5.2 Listening Skills How to listen effectively, listening comprehension		

5.3 Speaking skills speech, group discussion		
5.4 Writing skills précis writing, comprehension		
Total	32	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, videos, exercises

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1.	Practical Title: Fundamental of Communications skills
i.	Comprehension
ii.	Précis writing
iii.	Self-Introduction
2	Practical Title: Presentation Skills
iv.	Extempore speech
v.	Presentation on any given Topic
3	Practical Title: Technical Writing
vi.	Accident Report
vii.	Report on Institute function
viii.	Industrial visit report
ix.	Generic letters to the heads of various department/ Sections of the institute
x.	Enquiry letter
xi.	Quotation
xii.	Purchase or supply order
xiii.	Complaint letter
xiv.	Job application
4	Grammar
xv.	Exercises in subject – verb agreement
xvi.	Exercises in use of preposition
xvii.	Exercises in use of homophones, homonyms, homographs
xviii.	Exercises in use of punctuation
xix.	Exercises relating to correcting the sentences
xx.	Paragraph writing
5	Language workshop
xxi.	Exercises to improve reading skills

Directorate of Technical Education, Goa State

xxii.	Exercises to improve writing skills
xxiii.	Group discussion
xxiv.	Listening comprehension

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R. C. Sharma & Krishna Mohan	Business Correspondence and Technical Writing	Tata McGraw Hill
2	P. Prasad, Sharma, K. Rajendra	The Functional Aspects of Communication Skills	S.k. Kataria & sons
3	Sanjay Kumar, Pushpa Lata	Communication Skills	Oxford University Press
4	A.K. Jain, A.M. Shaikh & Pravin S R Bhatia	Professional Communication Skills	S. Chand
5	Wren & Martin	High School English Grammar & Composition	S. Chand, N. Delhi

9. Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Raul R. Timm	How to make winning presentations	Sneha Printers
2	Dale Carnegie, Training CPI	Stand and Deliver, How to become a masterful communicator and public speaker	Cox & Wyman, UK
3	John Seely	The Oxford Guide to Effective Writing and Speaking	Oxford University Press

Autobiographies, self-help books, Audio speeches given by famous personalities

Internet and Web Resources

<https://www.grammarly.com/>

<https://www.bbc.co.uk/programmes/articles/5QFnVy3xzT5htTh13cmP2P8/teacher-resources>

<https://Ted.com>

Videos and Multimedia Tutorials

https://you.tu.be/AykYRO5d_II

Directorate of Technical Education, Goa State

(AR101) BASIC ARCHITECTURAL DRAWING

1. COURSE OBJECTIVES: The students of Architectural Assistantship at entry level need to first gain an overview of the Architectural field. Hence, this course is designed to provide an insight, enhance their ability to produce freehand architectural sketches as well as develop measurement skills with an understanding between the inter-relation between human anthropometry and space.

2. TEACHING AND EXAMINATION SCHEME

Semester	I				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR101) BASIC ARCHITECTURAL DRAWING		L	T	P		TH	TM	TW	PR/OR	
		-	-	6	6	-	-	50	50	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify the different types of architectural drawings and its components.
2. Sketch freehand Architectural views of any given space to convey spatial character and proportions.
3. Prepare measured drawings of architectural spaces and building elements at required scales.
4. Derive functional space areas required for the given activity; to optimize usage pattern, circulation, furniture clearances and human interaction.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	-	-	-	-	-	1
CO2	3	2	3	3	1	1	3
CO3	3	3	3	3	2	2	2
CO4	3	3	3	1	3	1	3

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives		
Unit	M	Th r	CO	
1 INTRODUCTION TO ARCHITECTURAL DRAWING	2	4	CO 1	
1.1. Definition of architecture	-	1		
1.2 Describing the scope and role of an Architectural Assistant	-	1		
1.3 Recognizing the importance of drawing as means of communication	-	1		
1.4 Identification of different types of drawings, terminology of drawing components.	2	1		
2 PREPARING ARCHITECTURAL SKETCHES	10	20	CO2	
2.1. Choosing appropriate materials for sketching	-	1		
2.2. Understanding Principles of sketching	-	1		
2.3. Reproducing various sketching techniques	-	1		
2.4. Preparing Still life sketches of objects and buildings by selecting appropriate views	1	3		
2.5. Developing Visualizing skills based on given description/instructions.	3	3		
2.6. Sketch Memory drawings on given topic.	3	3		
2.7. Introduction to Measured drawings	-	1		
2.8. Measurement types : Visual measurement, modular measurement , Measurement with tools	-	1		
2.9. Understanding measurement Units(metres/ feet) , use of graph paper, scale	-	1		
2.9. Sketch various building elements/furniture orthographically.	3	5		
3 ANTHROPOMETRY	13	25	CO3, CO4	
3.1. Understanding Body proportions		-		
3.2. Find Structural dimensions		-		
3.3. Understanding Ergonomics		-		
3.4. Interrelate Functional body dimensions related to activities without furniture	3	6		
3.5. Interrelate Functional body dimensions related to activities with furniture	3	6		
3.5. Compute Functional Space utilization of single user for given activities ○ Without furniture: Walking, standing, squatting, etc.	3	6		
3.6. Compute Functional Space utilization of single user for given activities ○ With furniture: sitting, dining, reading on desk, etc.	4	7		
4 DRAWING COMPOSITION	5	9	CO3	

Directorate of Technical Education, Goa State

4.1. Defining Standard guidelines for building drawing based on ○ Drawing sheet: Different sheet sizes, orientation. ○ Drawing purpose	-	1	
4.2. Understanding composition of contents within Drawing template	-	1	
4.3. Understanding of different drawing scales.	1	1	
4.4. Understanding of Dimensioning & lettering with guidelines	1	1	
4.5. Composition of drawings: Arranging different scaled drawings together on various sheet sizes.	3	5	
5 PLANNING OF INTERIOR SPACES	20	38	CO4
5.1. Defining parameters of Interior space planning		1	
5.2. Understanding functional space utilization of multiple users for given activities	2	3	
5.3. Understanding furniture arrangements in layouts with respect to usage pattern and circulation in single volume spaces	2	3	
5.4. Providing Enclosure and Placement of fenestration and access to an interior space	-	1	
5.5. Visualizing Aesthetics of Interior arrangement	-	1	
5.6. Conduct Case studies of existing interior layout with respect to functional space utilization, furniture clearances & circulation spaces. Examples: • Residential spaces: Living room, Dining room, Bedrooms, Bathrooms: layout(wet area/ dry area) with fixture arrangement, Kitchens – layouts, cabinets, clearances • Restaurants- counters, dining tables and chairs, types and sizes, arrangement. • Office workstation • Reception desk area • Fruit/ vegetable/ fish Market single unit space for seller and customer.	3	4	
5.7. Infer/ estimating space requirement for the above.	3	5	
5.8. Derivation of functional space for the given project	10	20	
Total	50	96	

Note:

1. The design scope would be finalized by the concerned faculty
1. All Stages of Design process should be followed (conceptual, development, final) compulsorily for **Progressive assessment**.
2. The student would have to submit the design progress to the faculty as per the deadlines allotted.
3. Viva-voce for presentation of design

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, measurement exercises, site visits, case studies, practical studio work, & activities.

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1	Prepare a file on identification of different plan types and its components	2
2	Maintain a sketchbook for sketching exercises of still-life objects and building sketching	1
3	Visualization exercises on interpretation of the given description; and represent it graphically	3
4	Memory sketching on given topic	3
5	Measurement exercise of various building elements/furniture in plan and side elevations.	3
6	Prepare one sheet on functional body dimensions related to activities without furniture	3
7	Prepare one sheet on functional body dimensions related to activities with furniture	3
8	Prepare one sheet on space utilization without furniture	3
9	Prepare one sheet on space utilization with furniture	4
10	Arrange given drawings on various scales on different sheet sizes e.g. A1, A2 & A3	5
11	One sheet on functional space utilization of multiple users for given activities	2
12	One sheet on furniture arrangements in layouts with respect to usage pattern and circulation in single volume spaces	2
13	Case study and analysis of existing interior layout	6
14	Assignment on interior layout : Two sheets on derivation of functional spaces (min. 2 options) for the given assignment (plan and 2 elevations) Note: The scale shall be given as per the scope of the project.	10
	Total	50

Note:

1. The scope of drawings would be finalized by the concerned faculty
2. The student would have to submit the design progress to the faculty as per the deadlines allotted.

8. LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1.	Francis D.K. Ching	A Visual dictionary of Architecture	Van Nostrand Reinhold
2.	Fayal Greene	The Anatomy of a house – A picture dictionary of Architectural and Design elements	Doubleday
3.	Cyril M. Harris	Dictionary of Architecture and Construction	McGraw-Hill
4.	V.S. Pramar	Fundamentals in Architecture	Somaiya Publications Pvt. Ltd
5.	Francis D.K. Ching	Architectural Graphics	John Wiley & Sons
6.	N.D. Bhatt	Engineering Drawing	Charotar Publishing House
7.	Ernst Neufert	Neufert Architect's data	Blackwell science

(AR102) BUILDING CARCASS & COMPONENTS

1. COURSE OBJECTIVES: The students need to develop an understanding of the concept of building structure and its functional components. Hence this course will enable the students to gain knowledge about the building components and its functions, identify the carcass of a structure and its interrelation, and develop skill and knowledge on preparing drawings and sketches of building components.

2. TEACHING AND EXAMINATION SCHEME

Semester	I				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
		L	T	P		TH	TM	TW	PR/OR	
(AR102) BUILDING CARCASS & COMPONENTS		3	-	-	3	75	25	-	-	100

3. COURSE OUTCOMES:

successful completion of the course, the student will be able to:

the types of structures, its components, different tools, equipment and workers associated with different works in building construction.

building components, functions of tools and equipment, and role of worker on a construction site with safety measures.

appropriate graphical representation.

wall masonry

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	-	-	1	1	1	1
CO2	3	2	1	1	2	1	2
CO3	3	1	2	-	1	2	3
CO4	3	2	2	2	3	2	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN.

M = Marks	Thr = Teaching hours	CO = Course Objectives	
Unit	M	Thr	CO
1 :TYPES OF STRUCTURE	15	08	CO1, CO2
1.1 Introduction to types of building based on construction techniques, load bearing and framed structure, types of loadbearing eg, mud houses, stone/brick structure, types of framed structure eg Timber/steel/Bamboo (under various climatic and topographic conditions)	3		
1.2 Components of building and its function (carcass+ substructure+ superstructure)	3		
1.3 Terminology associated with construction methods, types of tools and equipment and its function, types of worker and their role with safety measures	3		
1.4. Drawing of types of tools, type of structure and components of structure	6		
2 -WALL AND MASONRY COLUMN	25	16	CO2, CO3, CO4
2.1 Types of walls, classification –load bearing and non-load bearing wall, – internal and external (partition wall, half wall, etc.) classification –based on material (stone/brick/wooden/etc.) Foundation –definition and functions.	5		
2.2. Stone Wall masonry joints in stone masonry, dressing of stone general principles, classification of stone masonry (ashlar and rubble)	3		
Sketches of types of stone masonry (ashlar and rubble)	3		
Supervise stone wall masonry	4		
2.3 Brick masonry up to 1 ½ brick- types of bricks, general principles, brick bond(English/Flemish/header/stretcher) bond in piers (masonry column) cavity wall (plinth to parapet) junction at sill and lintel, definition and types of pointing	2		
Sketches of brick bond(English/Flemish/header/stretcher and cavity wall	3		
Pointing (types sketches)	1		
Supervise brick wall masonry	4		
3 FLOOR (HORIZONTAL CIRCULATION)	10	07	CO1, CO2, CO3
3.1 Floor- Definition ,Functions and Components of Floor	4		
3.2Ground floor and basement floor- Definition and function	3		
3.3 Upper floor- Definition and function, Difference between ground floor and upper floor	3		
4 STAIRS AND RAMPS (VERTICAL CIRCULATION)	15	10	CO1, CO2,

Directorate of Technical Education, Goa State

			CO3
4.1 Definition and function of stair, difference between Ladder and Stair.	2		
Types of stair based on shapes and Sketch	5		
4.2 Ramp- Definition, Function , slopes and proportion	2		
Sketch of ramp to understand various slopes	3		
4.3 Power driven or Mechanical means of Vertical circulation- Lift and, Escalator (electric stair) – Identification and function only	3		
5 ROOF AND ROOF COVERINGS	10	07	CO1, CO2, CO3
5.1 Definition and functions, Terminology used in roof and roof coverings	2		
5.2 Types of Pitched Roof – Definition and function	2		
Other types of Roof – Flat, Shell and Domes- Identification and function	2		
5.3 Sketch the types of pitched roofs	4		
Total	75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, demonstrations, class room interactions, models, exercises, site visits and case studies.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Types of structure	8	15
2	Wall and masonry column	16	25
3	Floor (horizontal circulation)	7	10
4	Stairs and ramps (vertical circulation)	10	15
5	Roofs and roof coverings	7	10
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1.	Practical Title
Unit-1	A1 sheet- types of structure- framed structure and load bearing (sketches and reference images , brief note in context of climate, material, location.)
	A1 sheet- types of structure- load bearing structure(mud, brick, stone) sketches and reference images , brief note in context of climate, material, location
Unit-2	Site visit report-
	Joints in masonry- Brick and Stone- block model- junctions
	A1- sheet-Graphical representation on sheet of types of masonry , types of bonds
Unit-3	A1-sheet on floors – ground and upper floors- sketches and pics
Unit-4	A1-sheet on stairs and ramps – types of stairs based on shapes- sketches and reference images

Directorate of Technical Education, Goa State

Unit-5	A1-sheet on roofs- types of sloping roofs
No	Class room Assignments
1	Demonstration of tools- handling tool and safety precaution in laboratory
2	Prepare Chart- various workers (picture) and (brief note) their role in constructions
3.	A1 sheet- types of structure- framed structure(bamboo, steel, wooden)- sketches and reference images , brief note in context of climate, material, location.
4.	A1 sheet- types of structure- load bearing structure(mud, brick, stone) sketches and reference images , brief note in context of climate, material, location.
5.	Site visit – to visit the site and identify the components of building and submit site report
6.	Block model-Brick bonds- demonstrate the brick bond and types of bond
7.	Block model- joints in stone- demonstrate the stone joinery
8.	Masonry Wall model – group work- demonstrate wall masonry using brick
9.	A1 sheet- types of stair based on shape – sketches and notes
10.	A1 sheet- types of roof – sketches and notes

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Cyril M Harris	Dictionary of Architecture-2 nd Edition	Mc-Graw Hill
2	Sushil Kumar	Building Construction (latest edition)	Standard Publishers
3	S.P Arora and S.P.Bindra	Building Construction (latest edition)	Dhanpat Rai Publications
4	Dr. B. C. Punmia	Building Construction (latest edition)	Laxmi Publisher, New Delhi
5	Rangawala	Building Construction (latest edition)	Charotar Publisher
6.	S.V. Deodhar, R.M. Kulkarni, A.S. Wayal	Building construction system	Vrinda publications

(AR103) GRAPHICS-I

1. COURSE OBJECTIVES: The students are required to understand importance of technical drawing as communication tool. Hence this course enables the students to be competent to prepare sketches of architectural elements and draft simple objects using drafting tools.

2. TEACHING AND EXAMINATION SCHEME

Semester	I				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR103) GRAPHICS -I		L	T	P		TH	TM	TW	PR/OR	
		-	1	4	5	-	-	50	50	100

3 COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

- 1 Select appropriate use drafting tools for technical drawings.
2. Draw sheet layout with the appropriate line types, scale, architectural lettering and dimensions.
3. Draw a line, plane or solid using orthographic projections and isometric view.
4. Represent graphically architectural elements, landscape elements and objects in a drawing.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentatn& Testing	Engg. Practices for Society, Sustainab ility & Environment	Project Management	Life -long Learning
CO1	1	1	2	3	2	-	2
CO2	1	-	1	2	1	-	1
CO3	3	2	2	2	3	1	2
CO4	2	1	2	2	1	-	-

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. DETAILED COURSE CONTENTS

M = Marks	Thr = Teaching hours	CO = Course Objectives	
Unit	M	Thr	CO
1 .BASIC DRAWING AND LETTERING SKILLS	10	15	
1.1 Importance of sketching	-	1	CO1
1.2 Basics of sketching- observation skills			CO1
- Identify shapes, spaces, proportions, volume, colour, texture - Observe types of lines and connections of lines and shapes - Technique of sketching line, square, circle, ellipse, arcs, angles	4	6	

Directorate of Technical Education, Goa State

Sketching pictorial views of different types of objects			
1.3 Introduction to various types of lettering fonts. styles and way of dimensioning in roman and Devanagari script	3	4	CO2
1.4 Developing freehand lettering skills in different sizes and styles eg. compressed ,expanded, narrow	3	4	CO2
2 BASIC GEOMETRICAL CONSTRUCTIONS	10	15	
2.1 Introduction to drafting tools like set squares , T-square, scales , pencils of various grades ,erasers , templates	-	1	CO1
2.2 Introduction to various types of lines used in drawings eg projection line hidden line .understanding concept of line weight	-	1	CO2
2.3 Construction of lines , bisecting angles , drawing parallel , perpendicular lines .using different scales.	5	6	CO1
2.4 Construction of curves from points, construction of polygons with construction methods and with set squares, included angles and various geometrical curves. like parabola hyperbola ellipse cycloid, involute, spiral	5	7	CO1
3 ORTHOGRAPHIC PROJECTION	15	20	
3.1 introduction to theory of orthographic projections. format of drawing orthographic projections in plan and elevations (front ,left view , right view)	-	2	CO3
3.2 Orthographic projection of points ,lines, planes and solids with positions perpendicular and parallel to principle planes	6	10	CO3
3.3 Orthographic projections of composite solids with positions perpendicular and parallel to principle planes	9	8	CO3
4 ISOMETRIC DRAWING	10	20	
4.1 Introduction to axonometric , isometric drawing	-	2	CO3
4.2 Isometric drawings of basic planes and lines	6	8	CO3
4.3 Freehand isometric sketches of small objects	4	10	CO3
5 .GRAPHICAL REPRESENTATION	5	10	
5.1 Landscape elements trees in plan and elevation ,cars parking	1	4	CO4
5.2 Landscape furniture street furniture	2	3	CO4
5.3 Human figures in different activities	2	3	CO4
Total	50	80	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, indoor and exercises and outdoor case studies

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
Unit 1	Sketch book exercise – Freehand sketching techniques	4
	Graph paper exercise- freehand draw lettering on graph paper different sizes and styles	3
	1no A1 sheet – Pasting different fonts , styles and duplicating them	3

Directorate of Technical Education, Goa State

Unit 2	1no A1 sheet- geometrical construction of lines , angles, using different scales	5
	1no A1 sheet - Construction of curves and polygons	5
Unit 3	2nos A1 sheet – Orthographic projection of points ,lines, planes and solids with positions perpendicular and parallel to principle planes	6
	1no A1 sheet - Orthographic projections of composite solids with positions perpendicular and parallel to principle planes	9
Unit 4	1 A1 sheet – Isometric drawings of basic lines and planes	6
	Sketchbook exercise - Free hand isometric sketches of small objects	4
Unit 5	Sketchbook exercise – Free hand sketch of Landscape elements, street furniture, Human figures in different activities	5
	Total	50
No	Class room Assignments	Marks
1	Sketching- object drawing	
2	Memory drawing for sketching	
3	Practicing freehand lines vertical , horizontal , angular lines on sketchbook	
4	Graph paper exercise - freehand draw lettering on graph paper different sizes and styles	
5	Drawing curves, circle, with Use of compass with varying sizes and	
6	Drawing lines , shapes to scale using drafting tools	
7	Making model of planes ,to understand principle planes	
8	Understanding projection by taking photographs of model on all sides	
9	Understanding projection by use of models of planes , solids, objects	
10	drawing a isometric of object on sketchbook	
11	Practicing sketching of various landscape , furniture elements and human figures	

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	ND Bhatt VM Panchal	Engineering Drawing	R C Patel charotar stall, Anand
2	ND Bhatt	Elementary Engineering Drawing	
3	Shah Kale Patki	Building Drawing	Tata Mc Grawhill pub company Bombay
4	P.S.Gill	Engineering Drawing	
5	Albert O. Halse	Architectural Rendering	

(AR104) BUILDING MATERIAL - CONSTRUCTION

1. COURSE OBJECTIVES: The students are required to gain knowledge of the basic construction building materials which are either naturally available or produced locally and its use in building industry. Hence this course would enable the students to identify such materials, know its standard data, understand the materials characteristic, properties, advantages & disadvantage, its uses, measurement parameters, sustainability aspects, market value and availability etc. This would make the student competent in approving and selecting suitable materials for construction.

2. TEACHING AND EXAMINATION SCHEME

Semester	I				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
		L	T	P		TH	TM	TW	PR/OR	
(AR104) BUILDING MATERIAL - CONSTRUCTION		3	-	-	3	75	25	-	-	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify different material for construction with suitable specifications.
2. Describe the properties and characteristics of the material.
3. Handle the materials with prescribed precautions.
4. Approve quality of any construction material for durability, dimensional stability, appearance and sustainability.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	2	-	-	-	-	2
CO2	3	3	-	-	2	-	2
CO3	3	2	-	2	3	2	1
CO4	3	3	2	1	2	2	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives		
Unit	M	Th r	CO	
1 SUSTAINABLE MEASURES/ FACTORS OF BUILDING MATERIALS	4	3	CO1,CO2, CO3,CO4	
1.1 Importance of learning building materials , application into building , criteria of choosing, physical properties, chemical properties, characteristics of good material, natural, processed				
1.2 SUSTAINABILITY OF MATERIALS IN BUILDING INDUSTRY				
a) Introduction to sustainability factors of different building materials in building industry.				
b) Use of salvaged materials				
c) Materials with reclaimed and recycled content				
d) Introduction to local materials, rapidly renewable materials.(e.g. Wood)	4	3	CO1,CO2, CO3,CO4	
e) Ideal strategies of sustainability of building materials.				
f) Handling of materials during construction.				
g) Sustainability measures of predominately renewable energy in its extraction, production, transportation, fixing & ultimate disposal.				
h) Selection and Use of certified green building materials- prefab, green pro, etc.				
2 NATURAL BUILDING MATERIALS - RAW & BLOCK FORM	26	17	CO1,CO2, CO3,CO4	

2.1 RAW FORM 2.1.1. MUD / EARTH a) Introduction to Earth as a Building Material b) Field Analysis for Soil Identification c) Techniques of Building with Earth d) Compressed Stabilized Earth Blocks, Rammed Earth e) Advantage & disadvantage f) Application. g) Sustainability factor. 2.1.2. SAND a) Sources of sand, classification b) Properties of good sand c) Tests for sand. d) Substitutes for sand. e) Market standards. f) Sustainability factor. 2.1.3. WATER a) Introduction to Water as one of the most important element in the whole construction process, b) Quality of water, checks to perform before using water c) Sea water usage- defects. d) Sustainability factor.	6	3	
	2	1	CO1,CO2, CO3,CO4
	2	1	
2.2. BLOCK FORM 2.2.1. STONE a) Sources of stone, classification of stone b) Uses, availability, locally used examples in each type. c) Characteristics, properties & qualities of good building stone d) Field tests. e) Sustainability factor. 2.2.2. BRICK a) Introduction to brick as building material, uses, availability. b) General description on process of manufacture of bricks. c) Qualities of good brick d) Types of bricks, their properties, size –weight – shape e) Field test f) Comparison of brick and stone g) Substitutes for bricks. h) Sustainability factor.	8	6	CO1,CO2, CO3,CO4
	8	6	
3 BINDING MATERIALS	15	6	CO1,CO2, CO3,CO4
3.1 LIME a) Introduction to lime b) Sources of lime c) Classification of lime d) Precautions in handling lime e) Uses & field test. f) Sustainability factor.	5	2	CO1,CO2, CO3,CO4

3.2 MORTAR a) Definition b) Classification of mortars c) Properties of good mortar d) Types of mortar e) Uses, precautions f) Selection of mortar. g) Sustainability factors.	5	2	CO1,CO2, CO3,CO4
3.2 AGGREGATE a) Definition b) Classification, properties, function c) Types of aggregate d) Different sizes, their uses, availability. e) Sustainability factors.	5	2	CO1,CO2, CO3,CO4
4 PROCESSED & PRODUCED MATERIALS	20	14	CO1,CO2, CO3,CO4
4.1 CEMENT a) Introduction to cement , b) Physical properties c) Composition d) Types of cement and their properties & uses in building industry e) Field test f) Storage of cement, uses of cement g) Comparison in cement & lime. h) Sustainability factor.	6	4	CO1,CO2, CO3,CO4
4.2 CONCRETE a) Definition b) Properties c) Components of concrete, proportioning of , ingredients d) Water - cement ratio, workability e) Slump test f) Mixing of materials, transporting & placing g) Consolidation/ compaction of concrete, curing h) Types & uses. i) Sustainability factor.	8	6	CO1,CO2, CO3,CO4
4.3 STEEL a) Introduction b) Uses, properties, defects c) Types of steel & their properties d) Market forms & sizes. e) Sustainability factor.	6	4	CO1,CO2, CO3,CO4
5 NATURAL WOOD AS A BUILDING MATERIAL	10	8	CO1,CO2, CO3,CO4
5.1 TIMBER a) Introduction to timber as building material b) Varieties of timber	5	4	CO1,CO2, CO3,CO4

Directorate of Technical Education, Goa State

c) Qualities of good timber, defects d) Seasoning of timber, conversion, preservation, storage e) Market forms & sizes f) Advantages & uses in building industry. g) Sustainability factors.			
5.2 BAMBOO a) Introduction b) Uses, main properties c) Various shapes, forms and sizes d) Advantages, disadvantages e) Preservation f) Sustainability factor.	5	4	CO1,CO2, CO3,CO4
Total	75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises & assignments, report writing, presentations, site and market visits for practical knowledge.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Sustainable measures/ factors of building materials	3	4
2	Natural building materials - raw & block form	17	26
3	Binding materials	6	15
4	Processed & produced materials	14	20
5	Natural wood as a building material	8	10
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1.	Field Analysis for Soil Identification and Visits to local sites of rammed earth constructions to understand and visualize the material use.
2.	Visit to different sources of sand locally available and examine its properties practically and its market standards.
3.	Testing the strength of processed natural materials - stone and bricks, in civil laboratory.
4	Visit local construction sites to practically analyse the different types of binding materials and understand the types of mortar and its actual uses.
5	Processed & produced materials - cement, concrete, steel, to be analysed practically by market and site visits and examine the standards and qualities. Laboratory test to be done to examine its strength and permeability.
6	Timely Field visit to understand slump test, mixing of materials of concrete, consolidation/ compaction of concrete, curing, different types & uses.
7	Samples of different types of cement to be brought and analysed for its physical properties and compared.

Directorate of Technical Education, Goa State

8	Local Timber outlets to be visited and examine seasoning of timber, conversion, preservation, storage, market forms & sizes.
9	Visit to local bamboo outlet to study and understand various shapes, forms and sizes, preservation, sustainability factors.
10	To get practical knowledge, visit local sites and market to get better understanding of various materials, their cost and uses in building industry.
No	Class room Assignments
1	Explanation and discussion on each topic from unit 1 to 5 and daily class assessment.
2	Presentations on Techniques of Building with Earth be presented after practically visiting local outlets. (either individual or group)
3	Study the locally available stone used for construction. Submit a report or power point presentations.
4	Report writing for the visits of local brick outlets and actual types of samples to be presented as group discussions in class.
5	Samples of binding materials to be presented in class and discussed.
6	Presentation to be given/submitted on the visit to be done to timber outlet and its uses in building construction.
7	Report on sustainable use of bamboo as building material for constructions along with advantages, disadvantages.
8	Sustainability factor of each building material learned and analyzed through presentation or report.
9	Notebook assessment before every periodic test.

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	S.C. Rangwala	Engineering Materials	Charotar Publishing House
2	Sushil Kumar	Engineering Materials	Standard Pub. Dist. Delhi
3	Arora / Agarwal	Civil Engineering Materials	New India Pub. House, Jalandar
4	S.K. Duggal	Building Materials	New Age International Publishers

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Maïni, S.	Earthen Architecture http://www.earth-auroville.com ,	Auroville Earth Institute
2	Lyons, A.	Materials For Architects And Builders (2007).	Oxford: Elsevier
3	D. N. Ghose	Materials of Construction	Tata McGraw-Hill Publishing Company Limited, New Delhi.

Directorate of Technical Education, Goa State

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1		National Building Code of India 2016 Volume 1	Bureau of Indian Standards
2		National Building Code of India 2016 Volume 2	Bureau of Indian Standards

Internet and Web Resources

S. No.	Author	Title of Books	Publishers
1	Sruthi G S	MUD ARCHITECTURE Department of Applied Mechanics and Hydraulics, National Institute of Technology Karnataka, Karnataka, India	International Journal of Innovative Research in Science, Engineering and Technology <i>An ISO 3297: 2007 Certified Organization, Volume 2, Special Issue 1, December 2013</i>
2	P. Sharma, K. Dhanwantri and S. Mehta	BAMBOO AS A BUILDING MATERIAL International Journal of Civil Engineering Research. ISSN 2278-3652 Volume 5, Number 3 (2014), pp. 249-254 http://www.ripublication.com/ijcer.htm	© Research India Publications
3	Ar. Dhenesh Raj, Ar. Bindu Agarwal	BAMBOO AS A BUILDING MATERIAL Journal of Civil Engineering and Environmental Technology Print ISSN: 2349-8404; Online ISSN: 2349-879X; Volume 1, Number 3; August, 2014 pp. 56-61 http://www.krishisanskriti.org/jceet.html	© Krishi Sanskriti Publications
4		https://theconstructor.org/building/bamboo-as-a-building-material-uses-advantages/14838/	

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1		https://www.slideshare.net	

(AR105) BASIC MODEL MAKING

1. COURSE OBJECTIVES: The students of Architectural Assistantship would need to present a design with architectural models. Hence this course enables the students to gain exposure to model making materials and techniques, develop basic [skills](#) required for model making and make 3-D models from development of 2-D surfaces.

2. TEACHING AND EXAMINATION SCHEME

Semester	I				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR105) BASIC MODEL MAKING		L	T	P		TH	TM	TW	PR/OR	
		-	-	2	2	-	-	25	25	50

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Select appropriate tools, materials and techniques required in model making with skill and safety precautions.
2. Prepare 2-D basic shapes and 3-D components accurately.
3. Assemble the 2-D basic shapes and 3-D components precisely
4. Add surface finishes innovatively to the models.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	-	2	-	3	1	-	1
CO2	-	2	-	3	2	-	1
CO3	3	2	3	2	3	-	2
CO4	3	3	3	2	3	1	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives	
Unit	M	Thr	CO
1 INTRODUCTION TO MODEL MAKING	5	6	CO1
1.1 SCOPE OF MODEL MAKING • Introduction & importance of model making in architectural engineering. • Introduction to various techniques and skills in model making. • Transferring the drawing details on model making materials.	-	3	CO1
1.2 MODEL MAKING MATERIALS & TOOLS • Introduction to various types of materials available in model making and their specific utilization techniques. (e.g. - clay, types of papers, mount boards, etc.) • Various types of tools used for making models of specific materials.	5	3	CO1
2 BASIC SHAPES AND FONTS	5	6	CO2
2.1 SHAPE Cutting techniques & skills to derive different types of shapes such as squares, rectangles, polygons, etc. out of required materials with specific sizes/scales. (Stress to be laid on neat, clean and smooth cutting.)	3	3	CO2
2.2 FONTS Cutting of various font styles with accurate scale and sizes.	2	3	CO2
3 BASIC SOLIDS	5	7	CO2, CO3
3.1. Technique of Cutting and pasting.	1	2	CO1
3.2 Technique of Development of surfaces with graphical measurements to create basic forms (e.g. - pyramids, roofs, cylinder, etc.) by grid method and radial method. Assembling and pasting all necessary components together to make basic solids like cube, prisms, pyramids, etc.	2	3	CO2, CO3
3.3. Introduction to different methods to arrive at development of basic solids. Such as clay modelling, scraping method, carving, origami, paper mache etc. depending upon the types of materials.	2	2	CO2, CO3
4 COMPOSITE SOLIDS	5	7	CO3, CO4
4.1 DEVELOPMENT OF COMPOSITE SOLIDS Developing of composite solids with proper assembling all necessary components together by cutting, pasting, correct sizes with required scales & well finishing.	3	4	CO 3
4.2 INTERSECTION OF SURFACES - COMPOSITE SOLIDS Making of detail intersections in composite solids with neat finishing with relevant material.	2	3	CO3, CO4
5 INTRODUCTION TO SURFACE TREATMENT	5	6	CO4
5.1 MATERIAL COMBINATIONS Stress to be laid on neat cutting, pasting, correct sizes with required	2	3	CO2, CO3,

Directorate of Technical Education, Goa State

scales, well finishing.			CO4
5.2 COLOUR & TEXTURE Understanding and applying the techniques of colour and textures with required multiple material combinations and presentation.	3	3	CO2, CO3, CO4
Total	25	32	-

6. COURSE DELIVERY:

The Course will be delivered through lectures, audio visual presentations, demonstrations, model making, class room interactions, exercises and practical works.

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Collection of different model making material samples. Report on types of tools used in model making (identify and past pictures	3
2.	Drafting and cutting basic shapes of different sizes and materials	3
3.	Drafting and cutting of letters of various fonts with scale and sizes on required material.	2
4.	Make models of basic solids of given material	1
5.	Develop surfaces by grid method and radial method <i>e.g.: pitched roofs, prisms, pyramid, cones.</i>	4
6.	Prepare basic solids with specific model making material and technique.	2
7.	Making composite solids by assembling all necessary components together by cutting, pasting, correct sizes with required scales and finishing with specific required material.	3
8.	Making of detail intersections in composite solids with neat finishing with relevant material.	2
9.	Exercise on material combinations along with neat cutting, pasting, correct sizes with required scales, well finishing.	2
10.	Application of colour and textures with required multiple material combinations and presentation.	3
	Total	25

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Joseph Chiara and John Callen	Time Saver Standards - Building Types	Mc. Graw Hill int. Book Co.
2	Joseph Chiara and John Callen	Time Saver Standards - for Architectural Design Data	Mc. Graw Hill int. Book Co.
3	Sleeper	Building Planning Design and Standards	Jhon Wiley & Sons, New York.

Internet and Web Resources

S. No.	Author	Title of Books	Publishers
1		Arch Daily	
2		https://www.slideshare.net	

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1		https://www.slideshare.net	

Directorate of Technical Education, Goa State

(AR106) MATHEMATICS FOR ARCHITECTURE

1. COURSE OBJECTIVES: The students would need to develop a mathematical approach for solving engineering and technological problems. Hence this course would enable the students to acquire knowledge of Mathematical terms, concepts, principles and different methods; develop the ability to apply mathematical methods to solve technical problems, to execute management, plans with precision.

2. TEACHING AND EXAMINATION SCHEME

Semester	I				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR106) MATHEMATICS FOR ARCHITECTURE		L	T	P		TH	TM	TW	PR/OR	
		3	1	-	4	75	25	-	-	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Recall formulae of mathematics such as algebra, geometry, trigonometry & mensuration.
2. Use mathematical concepts.
3. Apply the formulae of mathematics to solve mathematical problems.
4. Solve linear equations by using determinants and metrics.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	2	-	-	-	-	1
CO2	3	2	-	-	-	-	1
CO3	3	2	-	1	-	-	1
CO4	3	2	-	1	-	-	1

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives	
Unit	M	Thr	CO
1.DETERMINANTS AND MATRICES	15	10	CO4
1.1 Determinants: Definition & order of determinant, value of determinant, properties of determinants(no question), Cramer's rule for solving equations with two & three variables	7		CO4

Directorate of Technical Education, Goa State

1.2 Matrices: - Definition & order of matrix, types of matrices, Equality of matrices, addition & subtraction, multiplication of matrices, Adjoint & Inverse of a matrix, solution of linear equations with two & three variables using matrices	8		
2 CO-ORDINATE GEOMETRY/ANALYTIC GEOMETRY	15	10	CO1, CO3
2.1 Coordinate systems. 2.2 Straight Line 2.2.1 Slope of line. Angle between two lines. 2.2.2 Various forms of equation of line (parallel to axis, point-slope form, slope intercept form, two point form, intercepts form & normal form). 2.2.3 General equation of a line. 2.3 Equations of circle, Equations of tangent & normal to circle.	7 8		CO1, CO3
3 TRIGONOMETRY & MENSURATION	15	10	CO1, CO3
3.1 Trigonometry: 3.1.1 Trigonometric functions, 3.1.2 addition and subtraction formulae, 3.1.3 Application to architecture. 3.2 Areas & volumes of Basic solids. (pyramid, prism, cone, cylinder, sphere)	7 8		CO1, CO3
4 ALGEBRA	10	10	CO1, CO3
4.1 Progressions 4.2 Definition of A, P and G. P, general term, summation of first end terms of series summation of n , n^2 and n^3 4.3 Arithmetic and Geometric series, A.M, G.M and their relation 4.4 Infinite G.P series and its sum.	10		CO1, CO3
5 PROBABILITY	20	24	CO2, CO3
5.1 permutations 5.2 combinations 5.3 binomial theorem (expansions using combinations, approximations) 5.4 sample space, events, probability definition 5.5 probability of an event 5.6 binomial distributions	3 3 4 5 5		CO2, CO3
Total	75	64	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions and exercises.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number		Marks
		Lectures	Tutorials	
1	Determinants and matrices	8	2	15
2	Co-ordinate geometry/analytic geometry	8	2	15
3	Trigonometry & mensuration	8	2	15

Directorate of Technical Education, Goa State

4	Algebra	8	2	10
5	Probability	16	8	20
		48	16	75
	Total	64		

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Deshpande S.P	Mathematics for Polytechnics	Griha Prakasham, Pune 1996 or latest

DIPLOMA IN ARCHITECTURAL ASSISTANTSHIP- CURRICULUM STRUCTURE

SEM -II			YEAR-I								
Semester	Code	Subjects	L	T	P	H	TH	TM	PR	TW	TOT
SECOND	AR201	Basic Architectural Design	-	-	6	6	-	-	50	50	100
	AR202	Building Construction	3	-		3	75	25	-	-	100
	AR203	Graphics- II	-	-	5	5	-	-	50	50	100
	AR204	Building Material-Finishing	3	-	-	3	75	25	-	-	100
	AR205	Advanced Model Making	-	-	2	2	-	-	25	25	50
	AR206	CAD for Architecture	-	-	2	2	-	-	25	25	50
	GC203	Environmental Studies	4	-	-	4	75	25	-	-	100
			10	-	15	25	225	75	150	150	600
L- Lecturers T – Tutorial P – Practical C-Credits TH – Theory Marks TM – Test Marks PR – Practical Marks TW- Term Work Marks											

Directorate of Technical Education, Goa State

(AR201) BASIC ARCHITECTURAL DESIGN

1. COURSE OBJECTIVES: The students will need to develop a design aptitude and be competent to design a single unit structure. Hence this course enables the students to gain an understanding of Design Fundamentals and methodology, derive architectural spaces as well as study their design perceptions critically.

2. TEACHING AND EXAMINATION SCHEME

Semester	II				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			H	Theory Marks		Practical Marks		
(AR201) BASIC ARCHITECTURAL DESIGN		L	T	P		TH	TM	TW	PR/OR	
		-	-	6	6	-	-	50	50	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify 3- dimensional characteristics of form and its derivatives; and composition using Basic Design Elements and Principles.
2. Conduct appropriate case studies and site analysis methodically for a given design project.
3. Derive Architectural spaces to fulfil the given functional and aesthetics requirements.
4. Design a single unit structure for a specified design brief on a given site; incorporating functional requirements and basic design principles.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	-	3	1	1	2	2
CO2	1	3	-	3	2	3	3
CO3	2	3	3	2	3	3	3
CO4	2	3	3	2	3	3	3

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 BASIC DESIGN IN ARCHITECTURAL FORM			12	22	CO1
1.1. Overview of 'Design'			-		
1.2. Overview of ' <u>Elements of Design</u> '			-	1	
o Identification of types of Elements of Design: point, lines, shapes and form			-	1	
o Determine characteristic of each element			-	1	
o Composition of elements with respect to linear, radial, cluster, grid,			-	2	

Directorate of Technical Education, Goa State

and centralized form, etc.			
1.3. Case study of elements of design	2	2	
1.4. Architectural composition using Elements of Design	2	2	
1.5 Overview of 'Principles of Design'	-	2	
o Identification of types of Principles of Design : Unity, contrast, harmony, symmetry (bilateral/ radial), axis, balance, symmetry, focus, hierarchy, rhythm, dynamics, proportion and scale	-	2	
o Understanding of Scale in Design : (visual scale, mechanical scale, human scale). Golden section	-	1	
1.6. Case study of Principles of Design	3	2	
3.7. Architectural 3-D composition using Principles of Design :Organization, structure, composition	3	4	
3.8. Represent the composition orthographically in 2 –dimensional drawings.	2	2	
2 AESTHETICS IN ARCHITECTURE	5	10	CO1
2.1 Colour in Design: Brief description of the use of various colour schemes in design	-	1	
2.2 Textures in Design: Brief description of the use of various textures in design. Types(visual/tactile), patterns (organic, non-objective, geometric, abstract) , finishes	-		
2.3. Understanding Composition with colour and texture	-	1	
2.4 Preparing a composition with colour and texture	2	2	
2.5. Identifying of various single basic forms and their variants/ derivatives , with openings, mass on columns eg. space, cube, pyramids, cylinder, cone	-	1	
2.6. Understanding characteristic of these single forms - dimensions, proportions	-	1	
2.7. Understanding characteristics of Space surrounding / into these single forms w.r.t. aesthetic space , architectural space	-	1	
2.8. Producing Aesthetic Architectural composition through Massing: o Massing: additive, subtractive and its articulation.	3	3	
3 CONCEPT OF ARCHITECTURAL SPACES	5	10	CO3
3.1. Understanding the Concept of Aesthetic space and its significance	1	1	
3.2 Understanding the Concept of Architectural spaces : w.r.t. functional and aesthetic space			
3.3. Case studies of Single unit structures eg. watchman's cabin, kiosk, individual rooms in a house	2	4	
3.4. Derive architectural spaces for the given single unit activity.	2	5	
4 DESIGN METHODOLOGY	8	16	CO2
4.1 Case study in design: Importance, appropriate selection of the case study, book case study, live case study , methodology, parameters of study(physical features, climate , socio-cultural aspect, historical context), graphical representation, Observations &Inferences	2	5	

Directorate of Technical Education, Goa State

4.2 Site analysis: Methodology, parameters of study , graphical representation, Observations &Inferences	3	5	
4.3 Development of design process: Design concept, bubble diagram, single line sketch, block model, sketch development, feedback, modification, final drawings, presentation with rendering and models.	3	6	
5 DESIGN OF SINGLE-UNIT STRUCTURE	20	38	CO4
5.1. Overview of designing of a single unit structure (Note: Application of all topics covered above is mandatory)	-		
5.2. Case study of a single unit structure	2	4	
5.3. Site analysis of given site	2	4	
5. 5. Design development: All Stages of Design process should be followed (conceptual, development, final) eg. Bus stop, watchman's cabin, etc.	16	30	
Total	50	96	

6. COURSE DELIVERY:

The Course will be delivered through lectures, PowerPoint presentations, exercises, site visits, case studies, internet review, architectural magazine review, group work, practical studio work, design feedback and viva voce.

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Identify elements of design and its composition (through review of architectural pictures from architectural books/ magazines and other sources and freehand sketches(A1 size sheet – 1 No)	2
2.	Prepare a 2-D composition of Elements of Design as per given brief (1 A1 size sheet)	2
3.	Identify Principles of Design (through review of architectural books/ magazines for books and other sources and freehand sketches(A1 size sheet – 1 No)	3
4.	Prepare a 3-D composition of Principles of Design as per given brief	3
5.	Represent the 3-D composition in the form of 2-D drawings	2
6.	To prepare a 2-D composition with colour and texture on the architectural elevations of the design. (A1 size sheet- 1 No)	2
7.	To identify various basic forms and their derivatives (through review of architectural pictures for architectural books/magazines and other sources and freehand sketches(A1 size sheet – 1 No)	3
8.	To review examples of aesthetic space and architectural spaces through pictures of architectural spaces from books and other sources (A1 sheet – 1 no)	1
9.	To review examples of Case studies of single unit structure	2
10.	To derive architectural spaces (in plan and section) of the given single unit activities (A1 size sheet- 1 No)	2
11.	Prepare a collage sheet of case studies of architectural design of a single unit structure and review its parameters of study and presentation	2
12.	Prepare a collage sheet of architectural site analysis and review its parameters of study and presentation	3
13.	Prepare a collage sheet of design processes by architects and review its methodology from bubble diagram to final building.	3
14.	Case study of single unit structure	2
15.	Site analysis of the given site	2

Directorate of Technical Education, Goa State

16.	Design and prepare drawings for a single unit structure as per given brief. (plan, 2 sections, 2 elevations & a finished model)	16
	Total	50

Note:

1. *The design scope would be finalized by the concerned faculty*
4. *All Stages of Design process should be followed (conceptual, development, final) compulsorily for **Progressive assessment**.*
5. *The student would have to submit the design progress to the faculty as per the deadlines allotted.*
6. *Viva-voce for presentation of design*

8. LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1.	Francis D.K. Ching	Architecture -Form , Space and Order	Van Nostrand Reinhold
2.	V.S. Prammar	Fundamentals in Architecture	Somaiya Publications Pvt. Ltd
3.	Joseph De Chiara Julius Panero Martin Zelnik	Time-saver standards for interior design and space planning	Mc-Graw-Hill International Editions
4.	Joseph De Chiara Lee E. Koppelman	Time- Saver Standards for Site Planning	McGraw-Hill Book Company
5.	Nancy Temple	Home Space Planning	McGraw-Hill

Directorate of Technical Education, Goa State

(AR202) BUILDING CONSTRUCTION

1. COURSE OBJECTIVES: The students need to develop an understanding of construction techniques in substructure and superstructure of a building. This course enables the student to gain knowledge about components and construction techniques in substructure and superstructure; and develops skill and knowledge on preparing sketches of components in plan, section, and elevation and as pictorial view. Also, they would learn the practical aspects involved prior to laying foundation of structure.

2. TEACHING AND EXAMINATION SCHEME

Semester	II				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR202) BUILDING CONSTRUCTION		L	T	P		TH	TM	TW	PR/OR	
		3	-	-	3	75	25	-	-	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Define the substructure and superstructure; its components* and subcomponents.
2. Describe the requirements and construction procedure of components*.
3. Sketch the components and subcomponents- in plan, section, elevation and as pictorial view.
4. Supervise the setting out of foundation of wall and pier foundation in brick and stone.

**Note: the following components are to be considered in this semester shallow foundation, composite masonry, wall openings, doors and window.*

4. Mapping Course Outcomes with Program Outcome

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic Discipline Specific Knowledge	Problem Analysis	Design and Development Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	2					
CO2	3	3	2	2	2	1	1
CO3	3	2	2			2	2
CO4	3	3	3	3	2	3	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 SUB STRUCTURE - (FOUNDATION AND PLINTH)	18	12			CO1, CO2, CO3, CO4
1.1 Foundation- Requirement of good foundation, excavation types of soil, bearing capacity of soil, types of foundations – shallow	1				
1.3 Plinth –Definition ,Function and courses of plinth	1				
1.2 Detailed drawing of types shallow foundation of wall and piers in bricks	5				

Directorate of Technical Education, Goa State

stone, RCC and steel			
1.4 Process in setting out of foundation wall trenches and pier footing, timbering of trenches	3		
Sketches of components of sub structure and Drawing setting out layout foundation.	3		
Demonstration of setting out on site. Supervise the setting out of foundation of wall and pier foundation in brick and stone	5		
2. COMPOSITE MASONARY	10	6	CO1,CO2, CO3
2.1 Superstructure and its Components , Composite Masonry-Detailing of composite material for walls like brick/stone, RCC / bricks, reinforced brick masonry	4		
2.2 Sketches for types of composite masonry	3		
2.3 Details of window sill, corbel, cornices, threshold, coping in masonry	3		
3: WALL OPENINGS	15	9	CO1,CO2,C O3
2.1 Lintel –definition, terminology,	2		
detailing of each type of lintel (sketches)	3		
2.2 Arches - definition, terminology, stability, classification based on shape, material and centers, scaffolding and	2		
detailing of each type of Arch (sketches and drafting)	4		
2.3 Roof(types and use)Dormer, skylight, ventilator- definition and function - and floor openings- location and function – cutouts, ducts, staircase	4		
4: DOORS AND WINDOWS	15	10	CO1,CO2,C O3
4.1 Factors for selection of Doors and windows, classification of doors and windows,	3		
4.2 sketches of simple doors and windows and ventilators in timber and metal	7		
4.3 Fixing techniques/ construction Procedure of types doors, grill work to door and window, fastening and ironmongery	5		
5. CONSTRUCTION OF ROOF IN TIMBER AND STEEL	17	11	CO1,CO2,C O3
5.1 TIMBER ROOF and TRUSS-Support system and classification based on support system, roof coverings for pitched roof ,method of fixing roof coverings	1		
5.2 construction details of Gable end , hipped end pitched roof in timber	2		
Construction details King post and queen post truss in timber and joinery	3		
5.3-STEEL ROOF AND TRUSS- advantages of steel truss over timber truss, roof coverings and method of fixing roof coverings	2		
Sketches of Types of steel truss suitable for various spans	3		

Directorate of Technical Education, Goa State

Steel Truss construction detail – (Truss suitable for span 8m, 16m) King post and queen post truss ,and tubular steel truss for span of 10m	3		
Total	75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Sub structure - (foundation and plinth)	12	18
2	Composite masonry	6	10
3	Wall openings	9	15
4	Doors and windows	10	15
5	Construction of roof in timber and steel	11	17
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	2 A1 sheet on types of shallow Foundation – in format sketch +brief note+ reference picture
	Site visit report on setting out procedure for building, wall and pier
	Reference model – showing method, pegs strings , etc used for setting out
2	1Sheet on types of composite masonry walls
	1 sheet-Sketch the details of composite masonry for walls , window sill, corbel , cornices threshold and copings in masonry.
3	Chart / sheet- with 2d model for types of Arches in format model/sketch +brief note+ reference picture
	sheet- types of Lintel in format sketch +brief note+ reference picture
4	2sheet types of doors and windows in format sketch +brief note+ reference picture
5	Block model- steel and timber truss
	2sheet types of roofs and trusses in timber and steel in format sketch +brief note+ reference picture
No	Class room Assignments
1	Make a sheet -Draw the types of shallow foundation and label it
2	Group work- make model explaining procedure of setting out of building for given site.
3	Site visit- to visit the site verify the contents of checklist and see the procedure of setting out foundation of wall and pier and preliminary preparation required for construction of building. Submit a site visit report
4	Sketch the details of composite masonry for walls , window sill, corbel , cornices threshold and copings in masonry.
5	Workshop- 2d model of arches – Student has to make thick paper cutting of brick or stone .and make model out of it with given scale. Compose all model in sheet
6	A1 Sheet on types of Lintel with its detailing
7	Time exercise-student has to list different doors and windows and group them base on uses and material to understand the functioning

Directorate of Technical Education, Goa State

8	Sketch the types of doors and write a note about where it can be used
9	Visit to hardware shops and get brochure for different fittings and fastening (iron monger), sizes aluminum frame, etc. used for doors and windows.
10	Presentation on sizes available in market for timber and metal frame and its type, types of grill used
11	site visit to building to see use of steel truss and steel truss joinery
12	Workshop- Block model of steel roof truss – making model in class
13	site visit to building to see use of timber truss and truss joinery
14	Workshop- Block model of steel roof truss – making model in class

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	W B Mckay	Building construction metric (volume 1to 4)	Mc-Graw Hill
2	Sushil Kumar	Building Construction (latest edition)	Standard Publishers
3	S.P Arora and S.P.Bindra	Building Construction (latest edition)	Dhanpat Rai Publications
4	Dr. B. C. Punmia	Building Construction (latest edition)	Laxmi Publisher, New Delhi
5	Rangawala	Building Construction (latest edition)	Charotar Publisher
6	Francis D.K. Ching	Building Construction	Pritoria Pictures of Building

Directorate of Technical Education, Goa State

(AR203) GRAPHICS II

1. COURSE OBJECTIVES: The students of Architectural Assistantship need to develop skills to prepare drafted drawings of complex objects and basic skills of rendering. This course would enable the students to visualize and draft complex architectural objects and prepare them for presentation.

2. TEACHING AND EXAMINATION SCHEME

Semester	II				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR203) GRAPHICS II		L	T	P		TH	TM	TW	PR/OR	
		-	-	5	5	-	-	50	50	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Explain methods to draw complex composition, rendering techniques and principles of construction of intersecting surfaces.
2. Draw orthographic views of complex objects and sections through complex solids.
3. Prepare pictorial views of given structures and pencil rendered presentation drawings.
4. Prepare drawings to make models of interpenetrating solids.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	1	1	1	1	-	2
CO2	3	3	3	2	2	1	3
CO3	2	1	2	1	2	2	2
CO4	3	3	3	2	2	1	3

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives		
Unit	M	Th	CO	
1. ORTHOGRAPHIC PROJECTIONS	14	22		
1.1 Orthographic projections of line, plane, solid, prism, pyramid and cones with positions inclined to any one principle planes	6	10	CO1	
1.2 Orthographic projections of line, plane, solid, prism, pyramid and cones with positions inclined to both the principle planes	8	12	CO1	
2. SECTIONS OF SOLIDS	8	14		

Directorate of Technical Education, Goa State

2.1 Orthographic projections of sections of primary and composite solids with positions perpendicular and parallel to principle planes	2	3	CO2
2.2 Orthographic projections of sections of composite solids with positions inclined to one of the principle planes.	2	4	CO2
2.3 Drawing section through various types of roof forms	4	7	CO2
3 ISOMETRIC DRAWING	10	16	
3.1 Isometric of composite solids	3	5	CO3
3.2 Drawing isometric views of articles and furniture	3	5	CO3
3.2 Isometric of building components, interpretive drawings as exploded axonometric	4	6	CO3
4 RENDERING SKILLS	10	16	
4.1 Importance of architectural presentations and introduction to rendering materials		2	CO4
4.2 Pencil rendering • use of tools, grades of pencils, charcoal pencil, types of papers • techniques of rendering, ie shading, stippling, smudging, line work, creating textures. use of thick thin lines .shadows		1	CO4
4.3 Rendering building elements. Representing materials Landscape elements	2	3	CO4
4.4 Rendering plan elevation section (small residential unit)	4	5	CO4
4.5 Rendering a building in isometric view	4	5	CO4
5. INTERSECTION OF SURFACES	8	12	
5.1 Intersection of line with different forms of solid	3	4	CO4
5.2 Orthographic projection of interpenetrating primary solids like prisms and pyramids , cones showing their line of intersections	5	8	
Total	50	80	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
Unit 1	2no A1 sheet - Orthographic projections of line, plane, prism , pyramid and cone with positions inclined to any one principle planes	6
	2no A1 sheet - Orthographic projections of line, plane ,solid ,prism, pyramid and cones with positions inclined to both the principle planes	8
Unit 2	1no A1 sheet - Sections of solids with positions perpendicular and parallel to principle planes	2
	1no A1 sheet - Sections of solids with positions inclined to principle planes	2
	Drawing section through various types of roof forms	4
Unit 3	2nos A1 sheet -Isometric drawings of composite solids and building elements	6
	1 no sheet – exploded isometric views and axonometric views	4
Unit 4	Sketchbook exercise- Techniques of pencil rendering	2

Directorate of Technical Education, Goa State

	1no A1 sheet - Presentation drawing of a residential unit	8
Unit 5	1no A1 sheet - Intersection of line with different forms of solid	3
	1no A1 sheet- Orthographic projection of interpenetrating primary solids like prisms and pyramids , cones showing their line of intersections	5
	Total	50
	Class room Assignments	Marks
1	Understanding Views of model by taking photographs and sketching it on sketchbook	
2	Cutting /chamfering the models to understand the sectional view and draw on sketchbook	
3	Sketching different types of roof forms on sketch book	
4	Drawing a section through the pitched roofs	
5	Demonstrating sections of different roof model	
6	Showing composite solid composition with the model and sketching on sketchbook	
7	Sketching on sketchbook -isometrics of furniture and set of furniture	
8	Showing model any joinery and draw a sketch showing exploded view of the same joinery	
9	Sketching using different grades of pencil to understand tone and shade	
10	Presentation on use of pencil rendering techniques	
11	Making different composition of solid to understand intersection of surfaces	

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	ND Bhatt / VM Panchal –	Engineering Drawing	R.C Patel Charotar Stall, Anand
2	ND Bhatt	Elementary Engineering Drawing	
3	Shah Kale Patki	Building Drawing	Tata Mc-Grawhill Publishing Company Mumbai
4	P.S.Gill	Engineering drawing	
5	Albert O. Halse	Architectural rendering	

Directorate of Technical Education, Goa State

(AR204) BUILDING MATERIAL – FINISHING

1. COURSE OBJECTIVES: The students are required to gain knowledge of the building materials used for finishing which is either available locally or manufactured; and its use in building industry. Hence this course would enable the students to understand the materials characteristic, properties, advantages & disadvantage, its uses, measurement parameters, sustainability aspects, market value and availability etc. This would make the student competent in approving and selecting suitable materials for finishing.

2. TEACHING AND EXAMINATION SCHEME

Semester	II				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR204) BUILDING MATERIAL - FINISHING		L	T	P		TH	TM	TW	PR/OR	
		3	-	-	3	75	25	-	-	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

5. Identify different material for construction with suitable specifications.
6. Describe the properties and characteristics of the material.
7. Handle the materials with prescribed precautions.
8. Approve quality of any construction material for durability, dimensional stability, appearance and sustainability.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic Discipline Specific Knowledge	Problem Analysis	Design and Development Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	2	-	-	1	-	2
CO2	3	3	-	-	2	-	2
CO3	3	2	-	2	3	2	1
CO4	3	3	2	1	3	2	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Thr	CO		
1 INDUSTRIAL / MODERN MATERIALS	16	10	CO1, CO2, CO3, CO4		
1.1 INDUSTRIAL TIMBER	5	4	CO1, CO2, CO3, CO4		
a) Introduction					
b) Types – uses					
c) Market sizes					

Directorate of Technical Education, Goa State

d) Advantages & disadvantages in building industry. e) Sustainability factor.			
1.2 FERRO CEMENT a) Definition b) Components properties c) Placing, application method & uses d) Advantages, disadvantages. e) Sustainability factor.	4	2	CO1, CO2, CO3, CO4
1.3 GLASS a) Introduction to glass as building material, b) Classification & properties , c) Treatment of glass, d) Uses & special varieties e) Sustainability factor.	4	2	CO1, CO2, CO3, CO4
1.4 ALUMINIUM a) Introduction b) Properties of aluminium & characteristics, c) Economics of using aluminium, d) Market forms & sizes of aluminium, e) Uses in building industry. f) Sustainability factor.	3	2	CO1, CO2, CO3, CO4
2 FLOOR FINISHING MATERIALS	18	11	CO1, CO2, CO3, CO4
2.1 TILES a) Introduction, b) Types of tiles - properties, usage, c) Market sizes. d) Advantages, disadvantages, e) Precautions f) Sustainability factor.	3	2	CO1, CO2, CO3, CO4
2.2 WOOD a) Introduction, b) Types and their - properties, usage, c) Market sizes d) Advantages, disadvantage e) Precautions. f) Sustainability factor.	3	2	CO1, CO2, CO3, CO4
2.3 STONES o NATURAL STONES o MARBLE o GRANITE a) Introduction, b) Types, properties, usage c) Market sizes. d) Advantages, disadvantages e) Precautions f) Sustainability factors	5	3	CO1, CO2, CO3, CO4
2.4 PVC a) Introduction, b) Types - properties, usage, c) Market sizes d) Advantages, disadvantages, e) Precautions f) Sustainability factor	3	2	CO1, CO2, CO3, CO4

2.5 GLASS a) Introduction, b) Types, properties, usage, c) Market sizes d) Advantages, disadvantages, precautions e) Sustainability factor	4	2	CO1, CO2, CO3, CO4
3 WALL FINISHING MATERIALS	16	10	CO1, CO2, CO3, CO4
3.1.PAINTS & VARNISHES a) General introduction b) Characteristics of ideal paint c) Ingredients of oil paint, types of paints d) Painting guidance e) Painting on different surfaces f) Failures of paint, defects in painting. g) Varnishing – ideal characteristics, types of varnishes, process of varnishing. h) Distempering – properties, process of distempering. Benefits. i) Sustainability factor	8	6	CO1, CO2, CO3, CO4
3.2. CLADDINGS a) Definition, b) Different types and their properties, use, c) Market forms & sizes. d) Sustainability factor	4	2	CO1, CO2, CO3, CO4
1.3.GYPSUM a) Introduction, b) Properties, uses c) Advantages, disadvantages d) Gypsum plasters e) Market forms & availability in India. f) Sustainability factor	4	2	CO1, CO2, CO3, CO4
4 COVERING /ROOFING MATERIALS	10	7	CO1, CO2, CO3, CO4
4.1.ROOFING MATERIALS a) Types of roofing materials b) Their properties, types, uses, advantages, disadvantages c) Market forms & sizes d) Sustainability factor	7	5	CO1, CO2, CO3, CO4
4.2.PLASTICS a) Introduction, types b) Major composition & classification c) Properties & uses in building industry d) Sustainability factor	3	2	CO1, CO2, CO3, CO4
5 MATERIALS FOR FIXTURES / OTHER MATERIALS OF EXTERIORS & INTERIORS/MISCELLANEOUS MATERIALS	15	10	CO1, CO2, CO3, CO4
5.1 PVC PIPES a) Introduction b) Advantages, disadvantages c) Precautions in design and installation d) Comparison with other pipes e) Requirements of different types of pipes used f) Sustainability factor	8	6	CO1, CO2, CO3, CO4

Directorate of Technical Education, Goa State

5.2 ADHESIVES a) Definition b) Advantages & disadvantages, c) Factors determining quality, d) Types of adhesives. e) Sustainability factor	4	2	CO1, CO2, CO3, CO4
5.3 BITUMEN a) Introduction b) market forms and their uses in building industry c) Sustainability factor	3	2	CO1, CO2, CO3, CO4
Total	75	48	-

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises & assignments, report writing, presentations, site and market visits for practical knowledge.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Industrial / modern materials	10	16
2	Floor finishing materials	11	18
3	Wall finishing materials	10	16
4	Covering /roofing materials	7	10
5	Materials for fixtures / other materials of exteriors & interiors/miscellaneous materials	10	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1.	Visit to local market outlets of industrial timber of various types, examine & analyse the available market forms and sizes.
2.	Different glass shops and production units to be visited and understand the market values and different uses of glass in building industry.
3.	Visit to local tile outlets examine the properties and market value and sizes.
4.	Visit to local units of wood flooring production and building having wooden flooring to examine and understand the feasibility and precautions of the material.
5.	Sample of different types of stones used for flooring to be brought and analysed for its physical properties and compared.
6.	To get practical knowledge, visit local sites and market to get better understanding of different types of paints, varnishes & distemper with specific utilization.
No	Class room Assignments
1.	Report on the industrial timer of different types after visit to market outlets.
2.	Assignment on treatment of glass and its building industrial use.

Directorate of Technical Education, Goa State

3.	Report / presentation on aluminium as a modern building material
4.	Samples of different types of types to be brought and class discussions.
5.	Presentation / submission on wood as a floor finishing material with examples based on visits.
6.	Class Discussion of different types of floor finishing materials used and its comparison.
7	Producing information on paints, varnishes & distemper in class discussions.
8.	Sustainability factor of each building material learned and analysed through presentation or report.
9.	Notebook assessment before every periodic test.

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	S.C. Rangwala	Engineering Materials	Charotar Publishing House
2	Sushil Kumar	Engineering Materials	Standard Pub. Dist. Delhi
3	Arora / Agarwal	Civil Engineering Materials	New India Pub. House, Jalandar
4	S.K. Duggal	Building Materials	New Age International Publishers

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Lyons, A.	Materials For Architects And Builders (2007).	Oxford: Elsevier
2		The Indian Concrete Journal	Published By ACC Limited
3	D. N. Ghose	Materials of Construction	Tata McGraw-Hill Publishing Company Limited, New Delhi.

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1		National Building Code of India 2016 Volume 1	Bureau of Indian Standards
2		National Building Code of India 2016 Volume 2	Bureau of Indian Standards

Internet and Web Resources

S. No.	Author	Title of Books	Publishers
1		<u>International Journal of Concrete Structures and Materials</u> March 2014, Volume 8, <u>Issue 1</u> , pp 83–97	
2		International Journal of Concrete Structures and Materials https://link.springer.com/journal/40069	Springer Singapore

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1		https://www.slideshare.net	

Directorate of Technical Education, Goa State

(AR205) ADVANCED MODEL MAKING

1. COURSE OBJECTIVES: The students need to develop the ability to visualize and make the various detailed models accurately. Hence this course enables the student to apply the model- making techniques to prepare various detailed models of building components, layouts & creating sloping topography of site. They would also be able to make a proper model of a ground structural unit by understanding the scale, various model making techniques, materials and tools.

2. TEACHING AND EXAMINATION SCHEME

Semester	II				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR205) ADVANCED MODEL MAKING		L	T	P		TH	TM	TW	PR/OR	
		-	-	2	2	-	-	25	25	50

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Select appropriate sequence for developing 3-D elements from the given drawings.
2. Develop Building, landscape and street furniture components for specified requirement.
3. Assemble different building components to a specified design layout.
4. Execute the complete model at required scale and specifications.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	1	3	-	-	1	2	1
CO2	2	3	3	2	2	1	2
CO3	1	2	3	1	2	2	1
CO4	2	2	3	2	2	2	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives	
Unit	M	Thr	CO
1 DEVELOPMENT OF BASIC COMPONENTS	5	8	CO1,CO2
1.1 FURNITURE Model to be made of furniture like, chair, benches, etc. as per required scale using different types of relevant materials.	2	4	CO1,CO2

Directorate of Technical Education, Goa State

1.2 LANDSCAPE ELEMENTS Model to be made of landscape elements like trees, shrubs, planters, vehicles, landscape features, etc. as per required scale using different types of relevant materials.	3	4	CO1, CO2
2 LAYOUT	5	4	CO3
2.1. LAYOUT MODEL Model to be arranged on a relevant base with necessary landscape, street furniture detailing as per required scale using different types of relevant materials.	5	4	CO3
3 BUILDING COMPONENTS	5	6	CO1,CO2
3.1 ELEMENTS OF BUILDING Making detailed model of building elements like railing, balconies, cornice, columns , chajjas, doors, windows, stairs, etc. with specific scale and measurements.	2	2	CO1,CO2
3.2 ROOFS Understanding and applying the techniques for developing roofs of different types.	2	2	CO1,CO2
3.2 BUILDING EXTERIOR TREATMENT Creating and developing different wall treatments like cladding with tiles, stone, etc.	1	2	CO1,CO2
4 MODEL OF SINGLE UNIT STRUCTURE	5	8	CO3,CO4
4.1 DEVELOPING UNIT STRUCTURE Developing a ground structural unit using required scale, structure can be of a small house, a cabin area, a unit space of desired function, etc. Stress to be laid on neat cutting, pasting, correct sizes with required scales, well finishing.	5	8	
5 TOPOGRAPHY SITE LAYOUT	5	6	CO3,CO4
5.1 SLOPING TOPOGRAPHY SITE Learning different Techniques in making contours. Creating a contoured site as per the given sloping topography.	5	6	
Total	25	32	-

6. COURSE DELIVERY:

The Course will be delivered through lectures, audio visual presentations, class room interactions, exercises and practical works.

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Make furniture models like chair, benches, etc. as per required scale using different types of relevant materials.	2
2.	Prepare Best out of waste landscape elements like trees, shrubs, planters, vehicles, landscape features, etc. as per required scale using different types of relevant materials.	3
3.	Theme based model to be made / arranged on a relevant base with necessary landscape, street furniture detailing as per required scale using types of relevant materials.	5
4.	Develop / make enlarge or live scale detailed model of building elements like railing, balconies, cornice, columns, chajjas, doors, windows, stairs, etc.	2
5.	Making roof of different types by applying various techniques of developing surfaces by choosing a relevant material.	2
6.	Create/ design and develop different wall treatments like cladding with tiles, stone, etc. in model by using various textured materials as per required scale.	1
7.	Develop a ground structural unit using required scale, could be team based, structure can be of a small house, a cabin area, a unit space of desired function, etc. model to be assembled with neat cutting, pasting, correct sizes with required scales, and well finished.	5
8.	Create a contoured site as per the given sloping topography, with required scales, and well finished by utilizing and examining various materials.	5
Total		25

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Joseph Chiara and John Callen	Time Saver Standards - Building Types	Mc. Graw Hill int. Book Co.
2	Joseph Chiara and John Callen	Time Saver Standards - for Architectural Design Data	Mc. Graw Hill int. Book Co.
3	Sleeper	Building Planning Design and Standards	Jhon Wiley & Sons, New York.

Internet and Web Resources

S. No.	Author	Title of Books	Publishers
1		Arch Daily	
2		https://www.slideshare.net	

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1		https://www.slideshare.net	

1. COURSE OBJECTIVES:

The use of Computer Aided Design (CAD) is a popular option used in the drafting of drawings and designing in the field of Architecture. It helps in effective graphical and technical communication across professional consultants in building industry. Hence a student of Architectural Assistantship needs to be competent in the skilful and effective use of the software to prepare drawings.

2. TEACHING AND EXAMINATION SCHEME

Semester	II				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR206) CAD for Architecture		L	T	P		TH	TM	TW	PR/OR	
		-	-	2	2	-	-	25	25	50

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify the various toolbars and commands of CAD software.
2. Draw, Edit, Modify and organize 2D drawing
3. Prepare a 2D drawing using the CAD software.
4. Print the 2D drawing.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	1	1	3	2	3	3	3
CO2	2	3	3	1	2	3	3
CO3	2	3	3	1	2	3	3
CO4	2	2	3	1	3	3	3

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS FOR TERM WORK & PRACTICALS

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Thr	CO		
1 Introduction and CAD Preliminaries.	1	1	CO1		
1.1 Computer aided drafting concept.					
1.2 Hardware and various CAD software available					
1.3 Components of a CAD software such as various toolbars in respective softwares					
1.4 File features Management: (like New file, Saving the file, Opening, Import and Export of file)					
1.5 Setting up the CAD environment; workspace.					
2 Drawing, Editing, Modifying and organizing 2D drawing:	8	14	CO2		
2.1 Drawing basic geometric elements (draw commands: line polyline, circle, arc, rectangle, ellipse, hatch, construction line)					
2.2 All View Commands: (like Zoom all, Zoom Previous, Zoom Extents, zoom window, zoom real time, Zoom Dynamic, Zoom Pan); viewport configuration.					
2.3 All Modify commands / Transformation commands: such as move , copy , rotate , Mirror, Trim, extend, fillet, chamfer, stretch, scale, Array, offset.					
3 Dimensioning and Tolerancing	6	6	CO2		
3.1 Annotation: Types of dimensioning, Linear, Horizontal, Vertical, Aligned, rotated, Baseline, continuous, diameter, radius, angular dimension, Leader.					
3.2 Dimension scale variable, adding geometric tolerances					
3.3 Editing dimensions					
3.4 Text styles: selecting font, size, arrows, alignment, line text, Multiline text.					
4 Organizing drawing components	6	6	CO3		
4.1 Concepts of layers : creation of new layers, on, freeze, lock, linetype, linewidth.					
4.2 Blocks: create, edit, insert.					
4.3 Altering the properties - layer, line type, transparency, geometry, colour					
4.4 Creating group, group manager, utilities (calculator, quick select, measures), clipboard.					
4.5 Import files of different formats, attach (inserts references such as other					

Directorate of Technical Education, Goa State

drawings, raster images and underlays)			
5 Model space, Paper space, viewports, layouts & Printing/Plotting	4	5	CO4
5.1 Concept of model space and paper space			
5.2 Creating viewports in model space and creating floating viewport in paper space.			
5.3 Shifting from model space to paper space and vice versa.			
5.4 Selecting various plotting parameters such as paper size, paper units, drawing orientation, plot scale, plot offset, plot area, print preview.			
Total	25	32	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions and computer exercises with feedback.

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	The students will set up their CAD workspace, organize needed toolbars and save the drawing as a template file for future use.	1
2.	Freehand sketch using Line command	1
3.	At least Five problems on different geometrical shapes using basic commands like line, Circle, Ellipse, Rectangle, Polygon ,etc.	1
4.	Exercises using modify commands like copy , rotate , Mirror, Trim, extend, fillet, chamfer, stretch, scale, offset.	1
5.	Array(Rectangular and polar),	1
6.	Creating single room unit drawing using commands with template.	4
7.	Text for the single unit exercise	3
8.	Dimensioning for single room exercise.	3
9.	Organising drawing components in layers	2
10.	Creating furniture blocks	3
11.	Attaching raster image in drawing	1
12.	Sheet format, sheet composition in layout space. Drafting of common template for all the following assignments with Institute logo and standard title block. Printing of a single unit drawing to various scales.	4
	Total	25

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	P. Nageshwar Rao	AutoCAD for Engineering drawing made easy – P. Nageshwar Rao- Tata McGraw Hill.	Tata McGraw Hill.
2	Sagar Linkan	AutoCAD 2018 training Guide	BPB Publications
3			
4	Sham Tickoo	PRO/ Engineer PTC creo parametric 3.0	Dreamtech Press (2015)
5	Sham Tickoo	Solid Works 2018	BPB Publication
6	Nader G. Zamani.	CATIA V5 Tutorials	SDC Publications

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Sham Tickoo	Pro/ENGINEER Wildfire 5.0 for Designers	CADCIM Technologies
2	Sham Tickoo	AutoCAD 2019: A problem Solving Approach	BPB Publication
3	George Omura	Mastering AutoCAD	BPB Publication
4	Sham Tickoo	CATIA V5-6R2017 for Designers 15th Revised Edition	BPB Publication

Internet and Web Resources

www.autodesk.com

Directorate of Technical Education, Goa State

(GC203) ENVIRONMENTAL STUDIES

1. COURSE OBJECTIVE:

Environment is the nurturing force upon which we depend. It decides our wellbeing, our health & quality of our life. The environment is deteriorating at an alarming rate due to increasing human activity and can be saved only by timely human action. The aim of Environmental studies is to sensitize the students towards the need to conserve & protect natural resources & biological support systems. With the aim to develop an attitude of concern for the environment the students will learn to choose environmentally friendly options for sustainable development and live in harmony with nature.

2. TEACHING AND EXAMINATION SCHEME :

Semester	II									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
(GC203) Environmental Studies		L	T	P	H	TH	TM	TW	PR/OR	
		04	-	-	04	75	25	-	-	100

3. COURSE OUTCOMES:

GC203.CO1: Understand the role and importance of various elements of Environment.

GC203.CO2: Identify the concerns related to the natural resources, ecosystems, biodiversity, pollution and social issues of environment.

GC203.CO3: Develop sensitivity towards Environmental issues.

GC203.CO4: Co-relate causes affecting the environment & biodiversity.

4. Mapping Course Outcomes with Program Outcomes :

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society, Sustain ability & Environment	Project Management	Life -long Learning
CO1	2	1	1	0	3	2	2
CO2	2	1	1	0	3	2	2
CO3	1	1	1	0	3	2	2
CO4	1	1	2	0	3	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			Mks	Thr	CO1, CO3, CO4
UNIT 1.0 : Multidisciplinary Nature of Environmental Studies			09	08	
1.1 Environmental studies : Definition , Scope and Importance					
1.2 Need for Public Awareness					

Directorate of Technical Education, Goa State

1.3 Environment & Human Health			
1.4 Environmental Ethics			
1.5 Value Education			
1.6 From Unsustainable to Sustainable Development : Concept and Guidelines			
1.7 Concept of Environmental Audit (EA) Environment Impact Assessment (EIA)			
1.8 Ecological Foot Prints			
UNIT 2.0 : ECOSYSTEM AND BIODIVERSITY	15	13	CO1, CO2, CO3, CO4
2.1 Ecosystem 2.1.1 Concept, Structure & functions of ecosystem (Function of producer, consumer and decomposer) 2.1.2 Food chain & Food web- Concept & Examples 2.1.3 Energy flow in Ecosystem 2.1.4 Ecological Pyramids (Inverted & Upright) Pyramid of Number, Biomass & Energy. 2.1.5 Ecological Succession (Primary & Secondary Succession) 2.1.6 Study of Ecosystem: characteristic features structure and functions) Terrestrial(Forest, Grassland, Desert) Aquatic(Pond, River & Ocean)			
2.2 Biodiversity 2.2.1 Definition of Biodiversity 2.2.2. Types of Diversity (Genetic, Species & Ecosystem) 2.2.3. Value of Biodiversity (Consumptive , Productive, Social ,Aesthetic Moral & Optional value) 2.2.4 India as a Mega- diversity Nation 2.2.5 Biogeographical classification of India 2.2.6 Extinct, Endangered, Threatened & Endemic Species -Examples (of India) 2.2.7 Threats to Biodiversity (Habitat loss, Poaching of Wild life & Man Wildlife Conflict) 2.2.8 Reasons for loss of Biodiversity 2.2.9 Conservation of Biodiversity (Insitu & Exsitu conservation)			
UNIT 3.0 : NATURAL RESOURCES	18	15	CO1, CO2, CO3, CO4
3.1 Forest Resource 3.1.1 Direct & Indirect value of Forest 3.1.2 Deforestation-causes & effects 3.1.3 Forest Management 3.2 Water Resource 3.2.1 Water as a scarce Resourc 3.2.2 Use and over exploitation of surface and ground water 3.2.3 Need for Water Conservation 3.2.4 Construction of dams- Benefits and draw backs (Rehabilitation & Resettlement of people) 3.2.5 Rain water Harvesting.			

3.2.6 Watershed Management 3.2.7 Conflicts over water in India 3.3 Energy Resource 3.3.1 Renewable & Non-Renewable sources of Energy 3.3.2 Growing Energy Needs. 3.3.3 Alternate Source of Energy (Solar ,Wind, Bio, Geothermal, Hydro & Nuclear Energy)			
3.4 Food Resource 3.4.1 Sources of Food 3.4.2 World Food Problems (Undernourishment & Malnourishment) 3.4.3 Changes caused by agriculture & overgrazing 3.4.5 Effects of modern agriculture on environment (use of synthetic fertilizers & synthetic pesticides in agriculture) 3.5 Mineral Resource 3.5.1 Types of Minerals 3.5.2 Use & Overexploitation of Minerals 3.5.3 Environmental Impact of Mining. 3.6 Land Resource 3.6.1 Pattern of Land Utilization (In India and World) 3.6.2 Land Degradation – Causes & Control Measures			
UNIT 4.0 : ENVIRONMENTAL POLLUTION- Sources , Effects & Control Measures	24	20	
4.1 Air Pollution 4.1.1 Definition, sources of air pollution(Primary and Secondary air pollutants with examples) 4.1.2 Effects on human health, animals, plants & Materials 4.1.3 Control of Air Pollution. 4.1.4 Removal of Particulate matter 4.1.5 Principles & Application of Control Equipments (Gravity and Inertial Separators, Cyclones, Filters, Electrostatic precipitators, Wet scrubbers) 4.1.6 Removal of Gaseous Pollutants (Combustion, Adsorption, Absorption) 4.1.7 Global Issues Definition, Cause & effects of Green House effect & Global Warming. Ozone layer Depletion, Acid Rain.			CO1, CO2, CO3, CO4
4.6 Noise Pollution :- 4.6.1 Definition. 4.6.2 Sources of Noise Pollution 4.6.3 Effects of Noise Pollution on Human health (Noise Induced hearing loss, Physiological & Psychological Effects) 4.6.4 Control of Noise Pollution.			
4.7. Nuclear Pollution / Radioactive Pollution:-			

4.7.1 Definition 4.7.2. Sources of nuclear Pollution (Natural & Man made) 4.7.3. Effects of Nuclear Pollution 4.7.4. Control of Nuclear Pollution 4.7.5. Disposal of Nuclear waste (Low, Medium & High activity waste) 4.7.6 Nuclear Accidents & Holocaust – case study			
4.8 Solid Waste Pollution. Definition: Refuse, Garbage Sources of Solid waste Types of solid waste (MSW, HW, BMW & EW) Effects of Consumerism Segregation of Solid waste at source Treatment of MSW (Open dumping, Land filling, incineration & composting) Waste Utilization (Reuse, Reclaim & Recycle) Solid waste Management System – Flow sheet diagram			
4.9 Role of an Individual in Prevention of Pollution.			
UNIT 5.0 : SOCIAL ISSUES & ENVIRONMENT	09	08	CO2, CO3, CO4
5.1 Environmental Legislation Article 47 & Article 51-A(g) of the constitution on Environment. 5.1.1 Protection Functions of Ministry of Environment and Forest Govt. of India Objectives & Functions of Central & state pollution Control Boards Environmental Protection Act. Air (Prevention & Control of Pollution) Act. Water (Prevention & Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Motor vehicle Act.			
5.2 Social Issues 5.2.1 Women & Child Welfare 5.2.2 Role of IT in Environment & Human Health 5.2.3 AIDS 5.2.4 Population Growth & Variation among Nations 5.2.5 Human Rights			
	75	64	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Multi-disciplinary nature of environmental studies	08	09
2	Ecosystem and biodiversity	13	15
3	Natural resources	15	18

Directorate of Technical Education, Goa State

4	Environmental pollution	20	24
5	Social issues & environment	08	09
	Total	64	75

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Erach Bharucha	Textbook of Environmental Studies	Universities Press (India) Private Ltd.
2	Dr. Suresh K. Dhameja	Environmental studies	S.K. Kataria & Sons
3	Y. Anjaneyulu	Introduction to Environmental Science	B.S Publications
4	S. Deswal & A. Deswal	A Basic Course in Environmental Studies	Dhanpat Rai & Co.
5	P. Meenakshi	Elements of Environmental Science and Engineering	Prentice Hall of India (PHI)

SEMESTER III

SEM -III			YEAR-II								
Semester	Code	Subjects	L	T	P	H	TH	TM	PR	TW	TOT
THIRD	AR301	Architectural Design -I	-	-	8	8	-	-	50	100	150
	AR302	Detailing in Construction	3	-	3	6	75	25	-	50	150
	AR303	Graphics-Presentation	-	-	4	4	-	-	50	50	100
	AR304	History of Architecture	3	-	-	3	75	25	-		100
	AR305	Measured Drawing	-	-	4	4	-	-	50	100	150
	AR306	Computer Graphics-I	-	-	4	4	-	-	50	50	100
			6	-	23	29	150	50	200	350	750
L- Lecturers T – Tutorial P – Practical C-Credits TH – Theory Marks TM – Test Marks PR – Practical Marks TW- Term Work Marks											

(AR301) ARCHITECTURAL DESIGN -I

1. COURSE OBJECTIVES: The students need to be competent to design a Ground + 1 residence on a given site complying with regulations. Hence this course enables the student to gain necessary knowledge about Building by-laws and regulations as well as understand the components of preparing approval drawings. Also, they would be able to comprehend space and circulation standards, regulations and design fundamentals for developing of a G + 1 structure on a given site; and understand the basic concepts and components of Site planning.

2. TEACHING AND EXAMINATION SCHEME

Semester	III									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
(AR301) ARCHITECTURAL DESIGN -I		L	T	P	H	TH	TM	TW	PR/OR	
		-	-	8	8	-	-	100	50	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Explain terminology of prevalent by-laws and Regulations.
2. Assemble a submission drawing for a given project; using drawings to required scale along with area statement in the departmental format.
3. Develop site planning layout for a specified design brief on a given site fulfilling functional and aesthetics requirements, providing efficient pedestrian and vehicular circulation and sustainable parameters.
4. Design a Ground +1 Residential bungalow on a given site; fulfilling specified functional and aesthetics requirements, providing effective spaces and circulation; and incorporating basic design principles, by-laws and sustainable parameters.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Tools, Engg. Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	2	2	1	1	1	3
CO2	2	1	2	1	2	2	2
CO3	3	3	3	1	3	2	3
CO4	3	3	3	1	3	2	3

Relationship : Low-1 Medium-2 High-3

Directorate of Technical Education, Goa State

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	2	1
CO2	2	1
CO3	3	2
CO4	3	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Thr	CO		
1. BUILDING REGULATIONS AND BYLAWS	15	20	CO1		
1.1. Introduction to Zoning regulations	-	1			
1.2 Importance and scope of bylaws	-	1			
1.3 Remembering and Understanding Terminology and Regulations : effective plot area, road widening, Permissible coverage, Permissible Floor Area Ratio, building height, setbacks, Minimum size of rooms, staircases and corridors, duct sizes, area free of coverage and F.A.R. ,open spaces, frontage, means of access, parking, etc.	-	4			
1.4. Preparation of Area diagrams and area statement	15	14			
2. CIRCULATION SPACE	10	16	CO3. CO 4		
2.1.Introduction to circulation in architecture	-	1			
2.2. Classification of types of circulation patterns: horizontal, vertical	-	1			
2.3. Describing Universal accessibility: barrier free access, ramp slope.	5	6			
2.4. Understanding Horizontal circulation patterns: - Linear pattern: linear peripheral, bilinear peripheral, tri-linear, peripheral, quadri-linear peripheral, - Spinal pattern: linear spinal, bilinear spinal, tri-linear, quadri-linear, centrifugal spinal	1	2			
2.5. Understanding Vertical circulation patterns, Multi-storeyed circulation	1	2			
2.6. Arrangement of various types of spaces around circulation	3	4			
3. SITE PLANNING	10	16	CO3		
3.1. Introduction to Site planning : , Basics of sustainable site planning	-	1			
3.2 Understanding aspects of site planning: circulation- (pedestrian, vehicular) , integrate existing site features, sloping sites/topography, vegetation requirement of open space, services	-	1			
3.3. Describing Landscaping elements: soft and hard, pavements, lawns, water bodies, sit-outs, trees.	-	1			
3.4. Understanding arrangement of Parking layouts: Requirements of parking space & circulation, types of parking patterns.	5	6			

Directorate of Technical Education, Goa State

3.5. Develop a sustainable site layout	5	7	
4 DESIGN OF GROUND + 1 STRUCTURE	55	60	CO4
4.1. Introduction to G+1 Bungalow design	-	2	
4.2 introduction to sustainable aspects in design :site planning, climatic responsiveness, ventilation, daylight, material and technology, services, etc.	-	2	
4.3 Understanding Design Requirements: The bungalow must be designed to include the following <u>functional requirements</u> (between 150-250 m ² total floor area) • Habitable areas: Formal living areas, , family room, Bedroom, Master bedroom , guest bedroom, • Non- Habitable areas: kitchen , W.C. , bathroom, attached bathroom, store, prayer areas, Utility areas • Semi-open areas: Verandas, balconies, terraces, patio, • Porch, parking area • Staircase, circulation passages should be effectively designed. The bungalow must be designed to include the following <u>aesthetics requirements</u> • Space composition • Volumetric massing • Elevation composition	-	2	
4.4. Case studies of G+1 bungalows	5	4	
4.5.Site analysis of the given site	5	4	
4.6 Establish conformity of Design to prevalent byelaws and regulations.	5	4	
4.7. Development of G+ 1 structure with proper design methodology	40	42	
5 INTRODUCTION TO SUBMISSION DRAWING OF A GROUND + 1 STRUCTURE	10	16	CO2
5.1. Framework of a Submission drawing as per prevalent byelaws The Bungalow design in Unit 4 to be used.		1	
5.2. Understanding the attributes to be shown of the sub-components of a submission drawing	-	2	
5.3. Prepare Area diagrams and statement	4	4	
5.4. Composition of a submission drawing.	6	9	
	100	128	

6. COURSE DELIVERY:

The Course will be delivered through lectures, PowerPoint presentations, site visits, case studies, group work, practical studio work, design feedback and viva voce.

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	The student is required to prepare A4 size booklet with assignments (written regulations, calculations, area diagrams, area statement etc.) for the given project.	15
2.	Identify different circulation patterns (through review of architectural pictures for books and other sources and freehand sketches(A1 size sheet – 1 No)	5
3.	Prepare a sheet from building standards and case study on circulation aspects for Universal accessibility(A1 size sheet – 1 No)	5
4.	Develop sustainable site layout around given buildings like residential complex,	5

Directorate of Technical Education, Goa State

	institutional, complex, exhibition pavilion, cultural centres, etc. Note: the project emphasis is on site planning and not on building design	
5.	Study parking lot (sizes, layouts) up to min 25 cars	5
6.	Case studies of G+ 1 Bungalow (at least 2)	5
7.	Site analysis of the given site	5
8.	Compute to establish conformity of design with prevalent byelaws and regulations.	5
9.	Develop a Ground + 1 structure, e.g. Bungalow as per the given design brief(site plan, floor plans, roof plan, 2 sections, 2 elevations, model) to 1:50 scale	40
7.	Compose an A1 size drawing in a proper template to prepare the submission drawing ○ Components of the sheet: floor plans, roof plan, section, elevation, area diagrams, location plan, site plan, compound wall part plan, elevation and cross- section. (<i>The photocopies of Bungalow design drawings at unit 4 ;should be utilized at required scales.</i>) ○ The Area statement should be incorporated on the sheet.	10
	Total	100

Note:

1. The design scope would be finalized by the concerned faculty
2. All Stages of Design process should be followed (conceptual, development, final) compulsorily for **Progressive assessment**.
3. The student would have to submit the design progress to the faculty as per the deadlines allotted.
4. Viva-voce for presentation of design

8. LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1		The Goa Regulation of Land Development and Building Construction (latest prevalent regulations)	Government Printing press
2.	Joseph De Chiara Lee E. Koppelman	Time- Saver Standards for Site Planning	McGraw-Hill Book Company
3.	Terence Conran	The Essential House book	Crown Trade Paperbacks New York
4.	Nancy Temple	Home Space Planning	McGraw-Hill
5.		The essential guide to- Contemporary Homes	Home Planners, Inc
6.	Joseph De Chiara Julius Panero Martin Zelnik	Time- Saver standards for Housing and residential development	Mc. Graw Hill Education

(AR302) DETAILING IN CONSTRUCTION

1. COURSE OBJECTIVES: The students need to develop an understanding of construction details of timber, steel and RCC used in construction of building. Hence this course develops skill and knowledge on preparing detail working drawings of building components in Timber, steel and RCC. They would also gain an insight on concreting procedure and preliminary work involved.

2. TEACHING AND EXAMINATION SCHEME

Semester	III				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR302) DETAILING IN CONSTRUCTION		L	T	P		TH	TM	TW	PR/OR	
		3	-	3	6	75	25	50	-	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Define timber joinery and steel interconnection.
2. Describe the concreting procedure, methods of damp proofing and water proofing
3. Prepare construction details of building components in timber, steel and R.C.C.
4. Supervise formwork and concreting procedure up to G+1 structure.

4. Mapping Course Outcomes with Program Outcomes

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	1	1	-	1	1	1
CO2	3	3	2	2	2	2	1
CO3	2	2	3	2	2	2	2
CO4	3	3	2	2	3	3	2

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	2	1
CO2	1	3
CO3	3	2
CO4	2	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Thr	CO		
1. TIMBERWORK	12	16	CO1,C O3		
1.1.Carpentry joints, Framing joints in Timber, comparison of timber with steel	2	4			
1.2. a) construction detail of Timber partition walls b) Detail : Upper floor (single joist, double and triple)	5	6			
1.3.Construction detail of staircase in Timber (plan, elevation, section and details)	5	6			
2. STEEL WORK	15	20	CO1,C O3		
2.1 Introduction to steel structural system	-	2			
a) procedure – Welding, riveting and	2	2			
b) Extruded steel section (channel, angle, I section, tubular, plate, T-section, Box section, Bars) , comparison of steel with Timber	1	2			
2.2 Steel component- composite steel section, stanchion, compression member, stanchion base, truss for larger span (open truss, north light, bowstring Arched, tubular steel)	3	4			
2.3 a)Typical details of steel components joinery	2	2			
b)Framed steel walls and details	2	2			
c) Floor and details (composite upper floor)	2	2			
d)Staircase details – straight flight, spiral stair	3	4			
3. REINFORCED CEMENT CONCRETE	30	40	CO2,C O4		
3.1 RCC and its components (column, beam, slab, lintel, staircase), a) Reinforcement Details and cover requirement, types of cover	3	4			
b) Shear Wall, RCC wall ,struts- Definition and function	2	2			
c) Properties of RCC over steel and timber structures	2	2			
3.2 Concreting Process- a) Proportioning, Mixing , placing, compaction and curing	6	8			
b) Important precautions and Safety measure on site while concreting and supervision, sustainable ways-	5	6			
c) Causes of failure in RCC structures- Defects in RCC, reinforcement corrosion	4	6			
d) Repairs of concrete structures					
3.3 Provision of joints in structures a) introduction and types of joints b)its Importance and function	4	6			
c) Sketches of expansion joint, isolation joint, contraction joints, sliding joint, construction joints, construction details of RCC stair	4	6			
4. FORMWORK	10	12	CO2,C O4		
4.1 Definition and importance of Formwork, economy in formwork, materials for Formwork, steel forms compared with timber formwork	1	2			
a) Scaffolding – definition, function and materials for scaffolding	1	-			

Directorate of Technical Education, Goa State

b) Shoring- definition, function and types	1	-	
4.2 construction of Formwork – propping, centring, shuttering, provision of camber , cleaning and surface treatment, order and method of removing formwork,	2	4	
4.3 Formwork for precast concrete	2	2	
Formwork in detail – a)formwork for foundation b) shuttering for column, slab and beam c) formwork for wall and staircase d) Safety measure and precautions on site	3	4	
5. DAMP PROOFING AND WATER PROOFING	8	8	CO2,C O4
5.1 Introduction, importance, causes and methods of damp proofing ,effects of dampness, methods of damp proofing and materials used for damp proofing course	2	2	
5.2 Water proofing techniques for toilet, bathroom sunk overhead Tank, underground sump, terraces and overhang	3	2	
5.3 DPC treatments in buildings –sketches and	3	4	
Total	75	96	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of hours		Marks
		Lectures	Practical	
1	Timberwork	8	8	12
2	Steel work	10	10	15
3	Reinforced cement concrete	20	20	30
4	Formwork	6	6	10
5	Damp proofing and water proofing	4	4	8
		48	48	
	Total	96		75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
Unit 1	Sheet – construction details of timber staircase	2
	Sheet- construction details of upper floor in timber	2
	Making model – any timber joinery used in upper floor / staircase	4
Unit 2	Sheet – extruded sections of steel and steel components connection	2
	Making model- steel component interconnection	4
	Sheet – details of steel staircase , frame steel wall, composite upper floor	4
Unit 3	Assignment- RCC components in superstructure and its function	4
	Presentation and hard copy submission- concreting process and its important precaution	4
	Case study – study of building and identify defects and probable causes – report submission with pics and sketches	2
	Assignment-provision of joints in structures- sketches of joints in structures	4

Directorate of Technical Education, Goa State

	Site visit- visit to ongoing site and understand concreting procedure at different stages. Submit report with brief notes and pictures	6
Unit 4	Sheet- sketches along with brief note on formwork for foundation, shuttering for column, slab and beam, formwork for wall and staircase.	3
	Site visit- visit to ongoing site and observe form work for various components Submit report with brief notes and pictures	4
Unit 5	Sheet- sketches and notes -DPC treatments in building	3
	Sheet- sketches and notes -water proofing treatment	2
	Total	50
No	Class room Assignments	
1	Workshop- visit to workshop to understand timber joinery	
2	Time Exercise-Provide solution for given situation in order to choose type of timber upper floor. Sketch plan ,section and details	
3	Time Exercise-Provide solution for given situation in order to choose type of timber upper floor. Sketch plan , section and details	
4	Workshop – visit to laboratory to understand methods of steel connection – welding and its types	
5	Class exercise –sketch steel components inter connection	
6	Making model of steel joinery showing components interconnection	
7	Drawing construction details of steel staircase and composite upper floor	
8	Group Presentation- concreting process and its important precaution	
9	Presentation – joints in structure –type and function	
10	Drawing construction details of RCC stair	
11	Sketching – type of joint	
12	Site visit to ongoing site to see formwork, scaffolding, concreting procedure	
13	Site visit – curing procedure and removal of formwork,	
14	Group Discussion DPC treatments and water Proofing treatment required in structure	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	W B Mckay	Building construction metric (volume 1to 4)	Mc-Graw Hill
2	Sushil Kumar	Building Construction (latest edition)	Standard Publishers
3	S.P Arora and S.P.Bindra	Building Construction (latest edition)	DhanpatRai Publications
4	Dr. B. C. Punmia	Building Construction (latest edition)	Laxmi Publisher, New Delhi
5	Rangawala	Building Construction (latest edition)	Charotar Publisher
6	R.B. Shivagunde , R.B. Asthana	Structural steel Drafting and Detailing	Somaiya publications Pvt ltd

1. COURSE OBJECTIVES: The students need to be competent to present design concepts such as rendered perspective views for marketing purpose. Hence this course enables the student to draw a building exteriors and interiors in perspective views and prepare rendered building drawings for presentation.

2. TEACHING AND EXAMINATION SCHEME

Semester	III									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
(AR303) GRAPHICS- PRESENTATION		L	T	P	H	TH	TM	TW	PR/OR	
		-	-	4	4	-	-	50	50	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Explain theory of drawing perspective views, sciography and, colour rendering techniques
2. Draw perspective views of building structures and interior perspectives
3. Draw shades and shadows on buildings in plan elevation and perspective views
4. Prepare rendered presentation drawings in colour medium.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	3	1	2	-	1	-	1
CO2	2	2	3	-	1	1	2
CO3	2	2	3	1	1	1	3
CO4	2	1	2	2	1	1	3

Relationship: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	1	1
CO2	2	1
CO3	2	1
CO4	3	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1. PERSPECTIVE DRAWINGS			10	14	
1.1 Introduction to perspective drawings			-	1	CO1
1.2 One point perspective view of vertical and horizontal planes, solids, furniture , interior objects etc.			3	4	CO1
Interior views of various rooms like kitchen bedrooms etc.					CO2
1.3 Two point perspective of horizontal and vertical planes ,simple and composite solids			3	4	CO2
1.4 two point perspective of building elements , building			4	5	CO2
2. SCIOGRAPHY			10	12	
3.1 Introduction to techniques of shades and shadows			-	1	CO3
3.2 Sciography lines, frames, planes, primary solids, composite solids			4	5	
3.3 Sciography of building components like steps columns, shades, niches etc.			6	6	CO3
3. PERSPECTIVE WITH SCIOGRAPHY.			10	14	CO3
5.1 Sciography on perspectives of small objects			4	6	CO3
5.2 Sciography on perspectives of buildings.			6	8	CO3
4.RENDERING IN COLOUR MEDIUM			8	10	
4.1 Use of tools various colour mediums – water colour, poster colours, Palette knife, palette, brushes of various sizes, drawing papers			-	1	CO1
4.2 Techniques of rendering of building elements and landscape elements, materials Dry brush, Washing, Stippling, splattering, Dabbing, Detailing, Under painting Glazing, Layering, scum bling, Bleed, Pulling, Lifting, Layering			8	9	CO4
5. PRESENTATION DRAWINGS			12	14	
5.1 Rendering building elements. Representing materials Landscape elements			3	4	CO4
5.2 Rendering plan elevation section (small residential unit)			4	4	CO4
5.3 Rendering a building in perspective view			5	6	CO4
			50	64	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
Unit 1	1no A1 sheet -one point perspective of vertical and horizontal planes	3
	1no A1 sheet -two point perspective of planes and objects	3
	1no A1 sheet -one point perspective of objects and interiors	4
Unit 2	2no A1 sheet -Sciography lines, frames, planes, primary solids, composite solids	4
	2nos A1 sheet - Sciography of building components like steps columns, shades, niches etc.	6
Unit 3	1no A1 sheet -Sciography on perspectives of small objects	4
	1no A1 sheet - Sciography on perspectives of buildings	6
Unit 4	Sketchbook – colour rendering of building elements and landscape elements, materials	8
Unit 5	1 no A1 sheet- presentation drawing of small residential unit (plan, elevation, section)	12
	Total	50
No	Class room Assignments	
1	Presentation – for understanding the concept of Perspective drawing	
2	Technique of drawing perspective drawing on sheet	
3	Sketching perspective view from the book , magazines	
4	Exercise 1 – block model and light source to understand concept of sciography	
5	Document Exercise 1 with photographs and sketch on sketchbook	
6	Exercise 2 –block model of building component and light source to understand concept of sciography	
7	Document Exercise 2 with photographs and sketch on sketchbook	
8	Practicing use of water colour to achieve effects of different elements	
9	Practicing use of poster colour to achieve effects of different elements	
10	Practicing use of water colour in plan ,elevation and section	

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	ND Bhatt / VM Panchal	Engineering Drawing	Rc Patel Charotar Stall, Anand
2	ND Bhatt	Elementary Engineering Drawing	
3	Shah Kale Patki	Building Drawing	Tata McGrawhill Pub. Company Mumbai
4	P.S.Gill	Engineering Drawing	
5	Albert O. Halse	Architectural Rendering	

1. COURSE OBJECTIVES: The students need to enhance their observational skills through the study of historical architecture to perform better in architectural field. The course develops the student's ability to identify architectural characteristics and critically appreciate various historical structures; and describe the influencing factors on various architectural styles. They would also be able to recognise and sketch distinct architectural elements in historical structures.

2. TEACHING AND EXAMINATION SCHEME

Semester	III								
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(AR304) HISTORY OF ARCHITECTURE	L	T	P	H	TH	TM	TW	PR/OR	
	3	-	-	3	75	25	-	-	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify the various historical styles of architecture and its elements
2. Describe the influences, characteristics and principles of Design in Historical styles.
3. Sketch prominent structure in Historical style
4. Appreciate contemporary and local architecture critically with regards to various influences on design.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	1	-	-	1	-	1
CO2	3	3	2	-	2	-	1
CO3	3	3	2	2	2	1	2
CO4	3	3	2	2	3	1	3

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	1	1
CO2	2	1
CO3	3	2
CO4	1	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Th r	CO		
1.IMPORTANCE AND SCOPE OF HISTORY	6	3			
1.1 Importance Of Learning History Of Architecture And Its Relevance To Contemporary Designs And As A Historical Record.	2	1	CO1		
1.2 Introduction to Terms Viz. • Evolution, Time Line etc. • Prehistoric, Historic, Vernacular, Contemporary • Western: Gothic, Renaissance, Post Renaissance • Indian: Hindu, Buddhist, Jain, Indo-Portuguese	2	1	CO1		
1.3 Factors Influencing Development Of Architecture viz: Location, Climate, Culture, Philosophy , Religion , Resources , Principles Of Design In Architecture	2	1	CO2		
2. INDIAN ARCHITECTURE	18	14			
2.1 Influencing Factors i.e. geographical, Culture, Climate, Resources , Religion • Characteristic Features And Principles Of Design In Architecture • Indus Valley Civilization (Residential And Town Planning) • Vedic Period (Residential And Town Planning)	3	3	CO1 CO2		
2.2 Buddhist Architecture • (Chaitya, Vihar, Stupa, Buddhist Order, Rock Cut Architecture Types Of Chaitya Arches) • Important Examples From Ajanta, Ellora, Karli, Sanchi	4	3	CO2 CO3		
2.3 North Indian Temple Architecture - • Characteristics, Influences and Design Principles in Various Components of Temple • Important Examples From (Orissa Temple, Konark Temple, Lingraja Temple, Khajuraho Temple)	4	3	CO2 CO3		
2.4 Central Indian temple style- • Components of temple, features of Chalukyan pillar, • Study important examples Hoysaleswara temple	3	2	CO2 CO3		
2.5 South Indian Temple • Style viz :Pandya, PallavaChola ,Madura, Vijaynagar • Examples of Madurai temple, Shore temple, Dravidian order, Gopuram.	4	3	CO2 CO3		
3 .ISLAMIC ARCHITECTURE IN INDIA	15	9			
3.1 Origin and Various Influences On Islamic Architecture • Development Of Indo-Islamic Architecture	5	3	CO1 CO2 CO3		

Directorate of Technical Education, Goa State

• Characteristic Features Of Mosque, Tombs, Palaces)			
• Types Of Domes, Arches, Minars			
3.2 Characteristics and Influences On Imperial Style and Provincial Style	5	3	CO1 CO2 CO3
• Study Of Qutb Minar, Qutb Mosque, Alai Darwaza			
• Study Of Gol Gumbaz at Bijapur, Jami Masjid At Ahmedabad			
3.3. Moghul Style- Characteristic Features	5	3	CO2 CO3
• Study Of Examples Of Fatepur Sikri, Taj Mahal			
4. WESTERN ARCHITECTURE	24	16	
4.1 Introduction And Influences	2	1	CO1
4.2 Egyptian Architecture (Mastaba, Pyramids)	5	3	CO2, CO3
4.3 Mesopotamian – (Ziggurats)	3	2	CO3, CO2
4.4 Greek- (Orders, Parthenon)	5	4	CO3, CO2
4.5 Roman- Orders, Pantheon, Colosseum	5	4	CO3 CO2
4.6 Renaissance Architecture- St. Peters Basilica, St. Pauls Cathedral	4	2	CO3
5.CONTEMPORARY ARCHITECTURE	12	6	
5.1 Factors that lead to development of Modern Architecture	6	3	CO1 CO4
• Design Philosophies Of Famous Architects – Frank Lloyd Wright , Le Corbusier			
• Design Philosophy Of Indian Architects – BV Doshi , Charles Correa			
• Influence Of Historical Structures On Contemporary Architecture In India			
5.2 Goan Vernacular And Indo-Portuguese architecture; influences, , characteristics, components	6	3	CO1 CO4
• Study of example of Hindu house with courtyard			
• Study of example of Christian house /mansion			
• Study of example of Historical Religious building/ structure			
Eg. Tambdi Surla Temple, Jama masjid , Ponda, Fatorpa Temple, Old Goa churches, Mangeshi Temple, etc.			
Total	75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Importance and scope of history	3	6
2	Indian architecture	14	18
3	Islamic architecture in India	9	15
4	Western architecture	16	24
5	Contemporary architecture	6	12
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
Unit 1	A4 size report- terms and influencing Factors on Development of Architecture	2
Unit 2	Sketch book- sketches of important structure in Indian architecture	4
	Site visit report	2
Unit 3	Sketch book – sketches with brief notes (site visit)	5
Unit 4	Sketch book – sketches with brief notes (site visit)	8
Unit 5	Sketch book – sketches with brief notes (site visit)	4
	Total	25
No	Class room Assignments	Marks
1.	Sketch and describe characteristics of given historical example form book	
2.	Trace the layout/facade and identify its design principle	
3.	Reading an article related to unit and summarizing the contents on notebook	
4	Group Presentation for specific topic in unit	
5	Quiz exercise – group exercise	
6	Debate activity – individual or group activity	
7	develop given elevation using historical element of that specific style	
8	Presentation on works of Architects to understand their design philosophy	
9	Presentation on influence of history on contemporary architecture	
10.	Study of various elements of vernacular style of Goa	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title Of Books	Publishers
1	G.K. Hiraskar	The Great Ages Of World Architecture	DhanpatRai Publication
2	Sir Bannister Fletcher	History of Architecture	CBS Publisher And Distributors
3	Percy Brown	Indian Architecture (Buddhist & Hindu)	D.B.Taraporewala Sons & Co. Pvt Ltd
4	Percy Brown	Indian Architecture (Islamic)	D.B.Taraporewala Sons & Co. Pvt Ltd
5	Gerard D'Cunha	Houses of Goa	King Street Press (November 1999)
6	Gerard Da Cunha, Akeru Barros Perelra)	The Indo - Portuguese House	

(AR305) MEASURED DRAWING

1. COURSE OBJECTIVES: The students need to be competent in conducting a measured drawing exercise and prepare its documentation. This course enables the student to gain an understanding of the scope of work, methodologies and procedures required for measured drawing and acquire skills in measured drawing using appropriate tools and techniques. They would also be to understand the significance of team-work, project planning and management and be able to represent the data in a systematic and presentable manner.

2. TEACHING AND EXAMINATION SCHEME

Semester	III				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR305) MEASURED DRAWING		L	T	P		TH	TM	TW	PR/OR	
		-	-	4	4	-	-	100	50	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify the measurement parameters of the structure and its components.
2. Determine requirement of tools, methods, procedures of measurements and documentation
3. Conduct measurement work on the given site methodically.
4. Prepare necessary drawings of the project in CAD and its documents.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	1	1	1	1	2	3
CO2	3	1	1	3	1	3	3
CO3	3	3	-	3	3	3	3
CO4	3	3	3	3	3	3	3

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	1	2
CO2	2	3
CO3	2	3
CO4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 INTRODUCTION TO MEASURED DRAWING			10	9	CO1
1.1 <u>Importance of measured drawing</u> i. Scope of work : extent of structure & area. ii. Related Terminology: conservation , restoration, addition/ alteration to existing structures, conservation			4	1	
1.2. Role of technician conducting a measured drawing ; Responsibility of Team members			-	1	
1.3. <u>Drawing Set</u> : checklist of drawings i. Title sheet: drawing index, ii. Site plans: plot boundary, transportation systems , influential geography, significant site structures services, topography, botanical materials(trees, shrubs, plants) iii. Site sections: with relationship of building with different levels of topography iv. Floor plans: with wall materials and openings, floor configuration, and finishes and significant structural members v. Elevation: principle facades of a structure vi. Sections: interrelation of different spaces with floors and site. Longitudinal or transverse, jogged vii. Details: significant architectural and engineering features, moulding profiles, cornices, columns, door and window cases viii. Interpretive drawings eg: exploded axonometric, cutaway views			6	7	
2 PLANNING OF MEASURED DRAWING WORK			10	4	CO1,C O2
2.1. Importance of Planning of work i. accuracy and verifiability ii. Planning parameter : iii. Determining the Objective of field work a. Site inspection b. Preparation of drawing/ document list c. Determine the methodology for Field measurement, documentation and representation d. Identification of building structure and its components			4	1	

Directorate of Technical Education, Goa State

iv. Locating existing records : cautions while referencing older records			
v. Ensuring integrity of the structure and the safety of the team members during the work			
2.2. Production phases: preparation, field work, preliminary drawings , Sequence of sketching	2	1	
2.3. Other mediums of documentation: Field photography, Field notes, photography	2	1	
2.4. Rectification of Errors and omissions: dimensional conflict and mismatch.	2	1	
3 TOOLS AND TECHNIQUES	10	9	CO2
3.1 <u>Hand measuring tools</u> : basic hand measuring equipment, establishing reference planes	2	2	
3.2 <u>Reference devices</u> : transit, string level , plumb bob	2	1	
3.3. Measuring devises, marking devises, holding devises, hand tools, apparel, data storage, drawing compass, magnetic compass	2	2	
3.4. Reference planes: datum lines i. <u>horizontal datum plane</u> : 4 major devises : water level, string level (bubble level), laser level, theodolite ii. <u>vertical reference planes</u> : 3 major devises for setting plumb bobs, laser levels, transits,/ theodolites	2	2	
3.5. <u>Hand measuring methods</u> : additive(cumulative) , running(consecutive) , swing ties to lines, trilateration, reference strings, poles, measuring diameters	2	2	
4 MEASUREMENT WORK	40	25	CO3
4.1 Methods of measuring building entities i. Measuring site plans: rectangular grid ii. Measuring building plans: exterior corner, room measurements with diagonal iii. Measuring facades iv. Measuring internal elevations and cross-sections v. Floor over floor positions vi. Measuring Trussed structures, truss components, use of symmetry	16	9	
4.2 Measured drawing work at field	24	16	
5 PREPARATION OF REPORT , DRAFTING , RECORDING AND DOCUMENTATION	30	17	CO4
5.1 <u>Final drawings</u> Systematic compilation of drawings, sequentially arranged	2	1	
5.2 Title sheet: drawing index	2	1	
5.3.List of drawing sheets: Site plans, Site sections, Floor plans, Elevations, Sections, Details	6	3	
5.4.Drafted to scale on Auto CAD; with graphical line weight, linetype	20	12	
Total	100	64	

6. COURSE DELIVERY:

The Course will be delivered through lectures, power point presentations , class room interactions, field visit, demonstration of techniques and conducting measured drawing,

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Prepare a report on the terminology used in measured drawing	4
2.	Download a measured drawing set of a project and note its parameters.	6
3.	The student will have to prepare a planning schedule and a methodology to be followed for the measured drawing exercise.	10
4.	The student will demonstrate the use of the Measuring tools, devices and methods	10
5.	The student will conduct measurement work; through correct procedure of measuring building entities and prepare preliminary drawing set. <i>Note: the student will have to verify and complete the exercise through secondary site visits.</i>	40
6.	The student is required to draft the preliminary hand- drawings on Auto CAD; to the required scale; and compose it on sheet layouts; and prepare a complete set.	20
7.	The student is required to write a report on the procedure of measured drawing exercise with supportive documents, sketches and photographs.	10
	Total	100

8. LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Robert Chitham	Measured Drawing for Architects	Architectural Press
2	Bert Dodson	Keys to Drawing	North light classis editions
3	W. Otie Kilmer Rosemary Kilmer	Construction Drawings and Details for interiors	Wiley
4.	Joseph De Chiara Julius Panero Martin Zelnik	Time-saver standards for Interior Design and space planning	McGraw –Hill International Editions Architecture series

(AR306) COMPUTER GRAPHICS-I

1. COURSE OBJECTIVES: The students need to be able to prepare and present 3-D computerised models. Hence the course trains the students to model from 2- D drawings using the 3- D features of AutoCAD and to render the models. Also it introduces the students to Sketch Up modelling.

2. TEACHING AND EXAMINATION SCHEME

Semester	III				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR306) COMPUTER GRAPHICS-I		L	T	P		TH	TM	TW	PR/OR	
		-	-	4	4	-	-	50	50	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Select correct tools required for 3-D model in Sketch Up and AutoCAD 3-D.
2. Execute the sequence of commands for achieving the final 3-D model in Sketch Up and AutoCAD.
3. Prepare 3-D models using Sketch Up and AutoCAD.
4. Render 3-D models using Sketch Up and AutoCAD.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	2	1	3	1	2	3
CO2	3	3	1	3	1	3	3
CO3	3	3	3	3	1	3	3
CO4	3	3	3	3	2	3	3

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	3	1
CO2	3	1
CO3	3	1
CO4	3	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Thr	CO		
1 SKETCH UP COMMANDS	10	12	CO1		
1.1 Basics of Sketch Up		4			
1.2 Specify the template (units)					
1.3 Zoom , pan, rotate					
1.4 Drawing tools :line, arc, freehand, rectangle, circle, polygon, push pull, move tool , copies & arrays, rotate, scale, mirroring objects, offset too, follow me, intersecting geometry, 2D/3D text, dimensions, components, layers,	2	4			
1.5 Selecting an entity, selecting surrounding entities, expanding a selection	1	4			
1.6 Different views, layout ,Position camera/look around, walk, scenes, selection	1				
1.7 Selection tool, navigation, accuracy, neatness of model, inference, inference locking, eraser, tape measure, protector tool, axes tool	2				
1.8 . Intersect with model: Transforming objects, cloning objects, grouping, hiding, locking objects	2				
1.9 . Utilizing 3 D warehouse	2				
1.10 . Importing and exporting(with similar units)					
2. MODELLING IN SKETCH UP					
2.1. Model a G+1 house in Sketch Up using all commands from Unit 1	10	18	CO1,C O2,C O3		
3. BASIC RENDERING IN SKETCH UP	5	4	CO1,C O2,C O4		
3.1. Introduction to rendering in Sketch Up	-	1			
3.2. Paint bucket, materials editor	1				
3.3. Apply suitable lights	1				
3.4. Warehouse, modify	1				
3. 5.Large toolset, edit	-				
3.6. Basic rendering in Sketch Up.	2	3			
4 AUTOCAD 3D MODELLING	15	17	CO1,C O2,C O3		
4.1. Drawing objects in 3 -Dimensional space	-	2			
4.2. Visual styles: creating 3 -D wireframe, 3- D hidden, 3-D shaded models	-				
4.3. Object modelling by modifying various types of UCS types	1				

Directorate of Technical Education, Goa State

4.4.Orbiting 3 Dimensional objects in space, using 3 D viewport to view these objects from different angles, multiple views of 3D models			
4.5. Revolve, extrude, rotate, mirror, array, creation of composite models using Boolean operations: union, subtract, intersect	1	1	
4.6.Solid modifiers, chamfer, fillet, slice, shell	1	1	
4.6. Extrusion of closed polyline, extrude along pathway, taper angle for extrusion, press pull bounded areas	1	1	
4.7. Polysolids, sweep, loft, Revolve, 3 D path	1		
4.8. Export into other formats: 3ds, dwg, rvt.	-		
4.9. Model an architectural component using the above commands	10	12	
5 AUTOCAD 3-D RENDERING	10	13	CO1,C O2,C O4
5.1. Introduction to computerized rendering	-	1	
5.2. Adding lights: Point light, spot light, distant light	2	2	
5.3.Lighting: adjusting lighting intensity, shadow , light colour, light placement, light properties		1	
5.4. Applying materials: defining materials, attaching materials to objects, importing and exporting materials ,Modify materials, using maps for realism	2	2	
5.5. Adding background, using raster images	2	2	
5.6. Camera: create a camera, camera properties	2	2	
5.7. Render: Overview of rendering, control the render environment, save and redisplay rendered images, formats of saving	2	3	
Total	50	64	-

6. COURSE DELIVERY:

The Course will be delivered through practical, demonstration and exercises

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Demonstrate the use of Sketch Up commands.	10
2.	Model a G+1 house in Sketch Up	10
3.	Render the G+ 1 model in Sketch Up	5
4.	Demonstrate the use of AutoCAD 3-D commands	5
5.	Model an architectural component in AutoCAD 3-D using commands learnt	10
6.	Prepare rendered images in Auto CAD using lights, materials and camera angles.	10
	Total	50

8. LEARNING RESOURCES

Videos and Multimedia Tutorials

S. No.	Author	Title of videos	Publishers
1		https://www.autodesk.com	
2		Sketch Up Training Series video tutorials	
3		www.sketchup.com	

DIPLOMA IN ARCHITECTURAL ASSISTANTSHIP- CURRICULUM STRUCTURE

SEM -IV			YEAR-II								
Semester	Code	Subjects	L	T	P	H	TH	TM	PR	TW	TOT
FOURTH	AR401	Architectural Design -II	-	-	8	8	-	-	50	75	125
	AR402	Building Construction systems	3	-	1	4	75	25	-	-	100
	AR403	Building Services –I	3	-	1	4	75	25	-	25	125
	AR404	Fundamentals of Structures	3	-	-	3	75	25	-	-	100
	AR405	Surveying	-	-	2	2	-	-	25	25	50
	AR406	Computer Graphics-II	-	-	4	4	-	-	50	50	100
	AR411, AR412, AR413, AR414	Elective Group E1	3	-	1	4	75	25	25	25	150
			12	-	17	29	300	100	150	200	750
L- Lecturers T – Tutorial P – Practical C-Credits TH – Theory Marks TM – Test Marks PR – Practical Marks TW- Term Work Marks											

Elective group E1	
AR411	Interior design
AR412	Landscape development
AR413	Sustainable Architecture
AR414	Architectural Conservation

1. COURSE OBJECTIVES: The students should be able to plan and develop a residential and commercial multi-storeyed building complex. The course will enable the students to understand the planning of multi-storeyed buildings and its components. They would be able to integrate service core, toilet blocks and building parking systems in building design. They would also be able to relate site development with building design. The course requires the students to prepare computerized drawings of their design and hence enhances their drafting skill.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
(AR401) ARCHITECTURAL DESIGN -II		L	T	P	H	TH	TM	TW	PR/OR	
		-	-	8	8	-	-	75	50	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify the location of services, parking facilities & toilet blocks for a multi-storeyed building complex.
2. Describe the planning of services, parking facilities & toilet blocks as per standards and prevalent by-laws.
3. Prepare a set of co-ordinated, accurate and graphically clear computerized presentation drawing for a given project.
4. Design a multi-storied residential and commercial building complex; considering prevalent bylaws and given design brief and providing suitable access, amenities, open spaces and other sustainable parameters in the site development layout.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Tools, Engg. Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	2	2	-	2	-	3
CO2	3	2	3	-	2	1	3
CO3	3	2	3	3	3	3	3
CO4	3	2	3	2	3	3	3

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	2	2
CO2	3	3
CO3	3	2
CO4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives	
Unit	M	Thr	CO
1. PLANNING OF SERVICES IN MULTI-STOREYED BUILDINGS	7	10	CO1, CO2
1.1. Introduction to services: importance, location in building w.r.t. circulation and functional spaces.	-	1	
1.2 Locate a Service core: List the components :lifts, staircase, toilet blocks, emergency escapes	-		
1.3. Describe the Functions of each component	-	1	
1.4. State the Minimum sizes of components as per bylaws	-		
1.5. Discuss the Services required as per regulations: fire fighting, water harvesting, vermi-composting	3	4	
1.6. Understand the arrangement of a service core	4	4	
2. PLANNING OF STILTS AND BASEMENT	4	8	CO1, CO2
2.1. Understand the Planning of Stilt : access, parking bays, column grid, height of stilt, effective circulation and parking bays considering column grid and service core location	-	1	
2.2. Understand the Planning of Basements :purpose, location w.r.t. road, building footprint, entry- exit access ramp, slope ratio, ventilation, height ,depth of basement, plinth height, retaining walls	-	1	
2.3. Case studies of a stilt in multi-storeyed buildings	2	3	
2.4. Case studies of a basement in multi-storeyed buildings	2	3	
3. PLANNING OF TOILET BLOCKS	4	8	CO1, CO2
3.1. Locate toilet block in building/ service core	-		
3.2. Understand requirements of ladies and gents toilet blocks , components, clearances, circulation, privacy	-	2	
3.3. Arrange W.C., urinals, wash basins, counters in a toilet block.			
3.5. Plan external wall treatment for service ducts.			
3.6. Case study of toilet block	4	6	
4.SITE DEVELOPMENT FOR MULTI- STOREYED BUILDING COMPLEXES	15	26	CO3 CO4
4.1. Understand concept of site development: influencing factors , sustainable parameters, integration of existing site features, topography, vegetation , entry, road network, open space, landscaping, parking, security, compound wall, planning services efficiently.	-	3	

Directorate of Technical Education, Goa State

4.2. Case study of site development layout	2	3	
4.3. Site analysis of the given site	3	4	
4.4. Design a site-development scheme for multi-storeyed building complex and prepare its computerized drawing.	10	16	
5. DEVELOPMENT OF RESIDENTIAL & COMMERCIAL MULTI-STOREYED BUILDING COMPLEX	45	76	CO3, CO4
5.1. Introduction to multi-storeyed building: definition, types: high-rise, midrise, structural systems, multi-storeyed circulation patterns, aesthetic components- massing.	-		
5.2. Case studies of multi-storeyed building	5	9	
5.3. Site analysis of the given site	5	9	
5.3. Design of a multi-storeyed building complex with a commercial building and a residential building on a given site, in accordance to prevalent building codes and regulations; and prepare its computerized drawing.	35	58	
Total	75	128	

6. COURSE DELIVERY:

The Course will be delivered through lectures, PowerPoint presentations site visits, case studies, group work, practical studio work, design feedback, viva voce and computerised drafting practical.

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	The student will be required to conduct at least 1 case studies of services for multi-storeyed buildings to study all aspects.(1 A1 size sheet)	3
2.	The student will be required to conduct at least 2 case studies of service cores in multi-storeyed buildings to study all aspects.(1 A1 size sheet)	4
3.	The student will be required to conduct a case studies of a stilt in multi-storeyed buildings to study all aspects.(1 A1 size sheet)	2
4.	The student will be required to conduct a case studies of a basement in multi-storeyed buildings to study all aspects.(1 A1 size sheet)	2
5.	The student will require to conduct at least 2 case studies of toilet blocks in multi-storeyed buildings to study all aspects.(1 A1 size sheet)	4
6.	The student will be required to conduct at least 2 case studies of Site development layout of multi-storeyed building complexes to study all aspects (1 A1 size sheet)	2
7.	The student will require to conduct a site analysis of the given site	3
8.	The students will have to design a site-development plan for multi-storeyed building complex accommodating parking, open space, security, services & sustainable parameters.(site layout plan, 2 cross sections through plot, views, model)	10
9.	The student will require to conduct at least 2 case studies each of multi-storeyed residential and commercial building studying all its parameters.	5
10.	The student will have to conduct a site analysis of the given site	5
11.	The student will be required to develop a design of a Residential and Commercial multi-storeyed building complex on the given site as per requirements. (Each building: Site plan, floor plans, roof plan, 2 sections, 2 elevations, model)	35
	Total	75

Note:

1. The design scope would be finalized by the concerned faculty

Directorate of Technical Education, Goa State

2. All Stages of Design process should be followed (conceptual, development, final) compulsorily for **Progressive assessment**.
3. The student would have to submit the design progress to the faculty as per the deadlines allotted.
4. Final submission :
 - For Unit 1,2,3,4: Presentation Drawings rendered manually.
 - For Unit 5 :Computerized drawings drafted to scale: submitted in soft and hard copy.
5. Viva-voce for presentation of design.

8. LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1.		National Building Code of India 2016 Volume 1	Bureau of Indian Standards
2.		National Building Code of India 2016 Volume 2	Bureau of Indian Standards
3.		The Goa Regulation of Land Development and Building Construction (latest prevalent regulations)	Government Printing press
4.	Joseph De Chiara Lee E. Koppelman	Time- Saver Standards for Site Planning	McGraw-Hill Book Company
5.	Joseph De Chiara Julius Panero Martin Zelnik	Time- Saver standards for Housing and residential development	Mc. Graw Hill Education

(AR402) BUILDING CONSTRUCTION SYSTEMS

1. COURSE OBJECTIVES: The students need to widen the scope of knowledge and develop an understanding of other methods of construction used and materials available. This course will enable the students to develop skill and knowledge on reading shop drawings of built -up system and learn the practical aspects involved construction of partition walls, installation of Built-up system and finishes. They will also gain knowledge about types of piles and long span tubular structure.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
		L	T	P		TH	TM	TW	PR/OR	
(AR402) BUILDING CONSTRUCTION SYSTEMS		3	-	1	4	75	25	-	-	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify types of piles and long span tubular structure.
2. Read shop drawings of built up system drawing and its specifications.
3. Correlate shop drawings of built up system with base architectural drawing.
4. Supervise construction of partition walls, installation of Built-up system and finishes.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	1	-	-	-	1	1
CO2	2	3	1	-	3	1	2
CO3	3	2	2	2	3	2	2
CO4	3	2	2	1	3	3	3

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

Directorate of Technical Education, Goa State

	PSO1	PSO2
CO1	1	1
CO2	3	2
CO3	3	2
CO4	2	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Thr	CO		
1- PARTITION WALL	18	16	CO4		
1.1 Classification-Internal and external, load bearing and non-load bearing,	3	3			
1.2 Advantages of partition walls, Requirements of a Good Partition Wall	2	3			
1.3 Details of Types based on material brick, clay , hollow block, cement concrete block, glass block , glass sheet, metal lath	8	6			
1.4 Details of Movable partitions, Portable partitions, Foldable partition	5	4			
2 –FINISHES	10	8	CO4		
1.1 Wall finishes : External and Internal,(plastering, Painting, stone/brick cladding)	3	2			
1.2 Floor finishes	3	2			
1.3 Stair and Slope finishes	2	2			
1.4 Ceiling Finishes – false ceiling	2	2			
3 ADVANCED DEEP FOUNDATIONS	12	10	CO1		
3.1 Piles – application of piles, and uses, Pile cap reinforcement	3	3			
3.2 classification based on material and function comparison	6	4			
3.3 Safety and control measures -'significant hazards' in the Construction Phase of piles, possible hazards and risks, Considerations and issues to be considered	3	3			
4.BUILT-UP SYSTEM (WALL/ FLOOR)	25	22	CO2 CO3 CO4		
4.1 -Wall -built-up system					
a) curtain wall - Introduction, types, methods of construction	2	2			
Detailing curtain wall	3	2			
b) Panelling (acp, etc.) Introduction, types, methods of construction and	1	1			
Detailing at junction of various components between different materials, method of fixing	2	1			
c) Floor built-up system: deck	2	2			
4.2 a) Precast concrete structures its components - connecting precast concrete element -Advantages over on site casting-Construction speed, effective design, flexibility	1	1			
Precast concrete structures its components – Details and shop drawing	3	3			
b) Prefabricated structure and its components- Definitions, applications, advantages and disadvantages	1	1			
Prefabricated structure and its components- Details and shop drawing	3	2			
c) Ferro cement – definitions, applications, advantages and disadvantages	3	3			
4.3 Safety measure for installation of built up system	4	4			

5. LONG SPAN AND TUBULAR STRUCTURE	10	8	CO1
5.1 Geodesic domes	3	2	
5.2 Space frame- definition and uses	2	2	
Shell structure- definition and uses	2	2	
5.3 Tensile structure- definition and material , suspended glass canopies	3	2	
Total	75	64	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of hours		Marks
		Lectures	Practical	
1	Partition wall	12	4	18
2	Finishes	6	2	10
3	Advanced deep foundations	8	2	12
4	Built-up system	16	6	25
5	Long span and tubular structure	6	2	10
	Total	48	16	75
		64		

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
Unit 1	2 Sheet – types of partition in format of (sketch brief note+ reference pic)
	Presentation on Movable and portable and foldable partition- uses and reference pictures and hard copy submission
Unit 2	Case studies-Includes study of existing building and identify for all types of finishes- submit report
	Group Presentation on types of Wall/Floor/Stair and Ramp/false ceiling-hard copy submission
Unit 3	1 sheet on types of piles based on material and function with reference pictures
	Case study – study of on-going construction pile work and observe safety measures- Hard copy to be submitted with site pictures and brief note
Unit 4	Group work- presentation and hard copy submission on curtain wall and panelling
	Submission of report – debate discussion
	4 Sheet /chart on installation of built up system-
Unit 5	Assignment on space frame , shell structure
	Assignment on tensile structure
No	Class room Assignments
1	Case study- visit existing given building(commercial / office/ restaurant) and understand use, types ,material of partition wall
2	Case study- use of movable partitions
3	Sheet on Details of Types based on material brick, clay , hollow block, cement concrete block, glass block , glass sheet, metal

Directorate of Technical Education, Goa State

4	Debate – Group discussion on types of wall built up system , advantages and disadvantages of each .
5	Debate – Group discussion on types of floor built up system , advantages and disadvantages of each
6	Presentation –on Curtain wall types, methods of construction
7	Presentation –on Panelling types, methods of construction
8	Presentation –on Ferro cement
9	Sheet on precast and pre-fabricated structures – brief notes+ reference picture showing use
10	Sheet/chart on safety measure for installation of each type built up system
11	Presentation on wall finishes, floor finishes, stair and slope finishes and ceiling finishes – hard copy submission

9. LEARNING RESOURCES

Reference books

S. No.	Author	Title of Books	Publishers
1	W B Mckay	Building construction metric (volume 1to 4)	Mc-Graw Hill
2	Sushil Kumar	Building Construction (latest edition)	Standard Publishers
3	S.P Arora and S.P.Bindra	Building Construction (latest edition)	DhanpatRai Publications
4	Dr. B. C. Punmia	Building Construction (latest edition)	Laxmi Publisher, New Delhi
5	Rangawala	Building Construction (latest edition)	Charotar Publisher
6	R.B. Shivagunde , R.B. Asthana	Structural steel Drafting and Detailing	Somaiya publications Pvt ltd
7	Joseph De Chiara Lee E. Koppelman	Time- Saver Standards for Site Planning	McGraw-Hill Book Company
8	Joseph De Chiara Julius Panero Martin Zelnik	Time- Saver standards for Housing and residential development	Mc. Graw Hill Education

(AR403) BUILDING SERVICES-I

1. COURSE OBJECTIVES: The students need to be familiarized with various aspects of plumbing, sanitary, drainage and electrical system in a building. Hence the course introduces the students to the various terminologies associated with the building services*. They would gain an understanding about the system and components involved in building services* and develop abilities to prepare layouts of the same.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
		L	T	P		TH	TM	TW	PR/OR	
(AR403) BUILDING SERVICES-I		3	-	1	4	75	25	25	-	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify the components of building services*.
2. Describe the systems and components building services*.
3. Prepare service layouts for building services*.
4. Examine existing building services* layout.

Building services* refers to plumbing services (Water supply, Sanitation, Rain water disposal) and Electrical.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	-	-	-	1	1	2
CO2	3	1	-	1	2	2	2
CO3	3	-	3	-	3	3	3
CO4	2	3	2	1	3	2	2

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	1	1
CO2	2	2
CO3	3	2
CO4	2	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 PLUMBING SERVICES :			15	13	CO1
1.1. Definition and importance of plumbing Scope – includes water supply (cold and hot water), drainage and sanitation			3	3	
1.2. Important terms in plumbing services			3	3	
1.3. a) water works, water supply system, domestic storage tank, flushing cistern ,feed cistern, geyser, period of supply			3	3	
b) drains, sewer, man hole, surface water, waste water and waste pipe, soil waste and soil pipe, ventilating pipe, pilot, pressure regulator			3	2	
1.4. Planning of Plumbing systems and types			2	1	
1.5. Plumbing piping and pipe sizes for plumbing work			1	1	
2 WATER SUPPLY			25	20	CO1,CO2
<u>2.1. Introduction</u> - Water requirement as per NBC: domestic purpose. - Local byelaws and Indian Standards - Sources of water supply, potable water , quality of water, physical tests - Components of water supply			3	2	
Water supply and public health			2	2	
<u>2.2. Distribution systems of water</u> <u>General considerations:</u> circulation of water, types (direct, indirect) construction and design, contamination by sewage earth cushioning, economy, fire demand, gradients, leakage, repairs, safety from pollution, unsafe cross connections			4	3	
<u>Method of distribution:</u> - Gravity system - Gravity and pumping system combined - Pumping system			1	1	
<u>2.3.Storage tanks in buildings:</u> <u>Service reservoirs:</u> types: overhead water tanks, elevated tanks, sumps/ Underground water tank and pump house, storage capacity. <u>Overhead water storage tanks:</u> pipe connections, diagram, Arrangement of various accessories in an overhead water storage tank.: ball valve with float, inlet pipe, outlet pipe, overflow pipe, scour pipe, cover <u>Underground water storage tank /sump</u>			5	4	

Directorate of Technical Education, Goa State

4. <u>Surface reservoir</u> : precautions, diagram			
5. <u>Elevated reservoir</u> - design aspects: accessories, depth, foundations, location, materials of construction, computation of water needs, storage capacity, diagram			
2.4. Systems of supply of water- continuous, intermittent Hot water system-using electrical water heater system & Solar powered	1	1	
2.5. <u>Pipes and fittings for water supply</u> <u>Types of Pipes</u> : Materials, sizes-GI pipe, copper pipes, PVC pipes ○ Joints, junction of pipes, angle, tee, cross, cap, plug, barb, coupling, union, reducer. ○ <u>Valves</u>-function: globe valve, gate valve, float valve, bib cocks, stop cocks, diagrams. ○ <u>Connection methods</u>- threaded pipe, solvent welding, soldering ○ <u>Service connection</u>: function, sketch of a bronze ferule, Goose neck, stop cock, sluice gates water meter, isolation, throttling, non-return valve	4	3	
2.6. <u>Methods of laying distribution pipes</u> : Dead –end method, grid iron, circular, radial, stand pipes	1	1	
2.7. Connection of water supply pipes to taps and sanitary fittings /fresh water waste water discharge ○ Relation of water supply to Civil works	1	1	
2.8. <u>Maintenance of distribution system</u> ○ Inspection and maintenance	1	1	
2.9. Water supply layout from mains to water points in a house –inclusive of overhead water tank, sump.	2	1	
3 SANITATION	15	12	CO2, CO3, CO4
3.1 Introduction to Sanitation ○ Purpose of sanitation ○ Principles of sanitation ○ Technical terms: water conveyance system, soil pipes, waste pipe, ventilation pipes, drain, sewage, gully trap, grease trap, inspection chamber, ventilating pipes and manhole ○ Local byelaws and public health requirement	2	1	
3.2 Septic tank and soak pit: size as per occupancy, Construction working.	3	3	
3.3. Drainage system for a house ○ Principles of house drainage ○ Waste disposal plan, sanitary layout from sanitary unit in a house or building to conveyance system. ○ Section of a building with house drainage arrangement	3	2	
3.4. TRAPS ○ Traps, definition, function, requirements of a good trap ○ <u>classification according to shape</u>: P-trap, Q trap, S-trap(with sectional sketches) ○ <u>Classification according to use</u>: Floor trap, Gully trap, intercepting trap- merits, demerits(with sectional sketches) ○ disconnecting chambers,	1	1	
3.5. PIPES: ○ Anti- Siphonage pipes, Cowl, Fresh air inlet, soil pipe, vent pipe,	1	1	

Directorate of Technical Education, Goa State

waste pipe ○ Material, sizes and gradient			
3.6. SANITARY FITTINGS: ○ Planning and layout of sanitary fittings, ○ Relation of drainage to Civil works ○ Bath tubs, drinking fountain , flushing cisterns, sink, urinals, wash basins, water closet- Indian type, European type(with sectional sketches) ○ Bidet connection to waste pipes and vents,	3	2	
3.7. SYSTEMS OF PLUMBING: ○ Single stack system, One-pipe system, One-pipe system partially ventilated, Two- pipe system.	1	1	
3.8. TESTING OF DRAINS AND PIPES	1	1	
4. RAIN WATER DRAINAGE OF BUILDING	5	6	CO2,CO3, CO4
4.1. Disposal of roof drain, rain water drain , fittings ○ Relation of drainage to Civil works	2	2	
4.2. Sewer, construction, gradients	1	1	
4.3. Drainage layout of building : storm water drain, rain water harvesting	2	3	
5 .ELECTRICAL SERVICES	15	13	CO1,CO,C O3,CO4
5.1 Basic concept of electricity a) Concept of electric current and voltage b) Electric circuit, Open and short circuits, Series and parallel circuits	2	2	
5.2 Electric supply system	3	2	
a) Single and three phase A.C. circuits			
b) Electric distribution system			
c) Transformer			
d) Service panels (MDB, SDB)			
e) methods of wiring- open and concealed -its merits and demerits			
5.3 Fixtures and Fittings	2	2	
a) Switches –one way and two way			
b) light fixture- wall mounted , ceiling,			
c) fan- ceiling, wall mounted , standing, exhaust fan			
d) fridge/TV/ AC			
5.4. Safety and protection	2	2	
a) Fuses, MCB and MCCB			
b) Earthing			
c) Methods of earthing			
5.5. Electrical layout of buildings with symbols., Electrical symbols	6	5	
	75	64	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises, site visits and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of hours		Marks
		Lectures	Practical	
1	Plumbing services	10	3	15
2	Waters supply	15	5	25
3	Sanitation	9	3	15
4	Rain water drainage of building	4	2	5
5	Electrical services	10	3	15
		48	16	75
	Total	64		

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1	Report on scope of work plumbing services in Building	2
2	Presentation on Important terms in plumbing services-	3
3	1 case study report on storage tanks in building	2
4	1 sheet on valves and fittings required	3
5	1 sheet on Drawing of water supply layout of a house	3
6	1 sheet on Drainage layout of sanitary sewage of the building with septic tank and soak pit details	2
7	1 sheet on details of internal plumbing layout of a toilet showing all sanitary fixtures	3
8	1 sheet on storm water drainage layout of a building and the surroundings	2
9	1 sheet on Electrical layout of a house	5
	Total	25
No	Class room assignments	
1	Conduct market study and collecting informative brochures and specification on various electrical fixtures and fittings	
2	Conduct market study and collecting informative brochures and specification on various pipe and fittings used for plumbing	
3	Conduct market study and collecting informative brochures and specification on various sanitary fittings	
4	Identify, wiring accessories Switches, sockets, luminaries, distribution board, fuse, MCB, MCCB etc and their Application	
5	Site visit- to a construction site of any residential building and study plumbing and electrical layout and submit site visit report.	
6	Case study of any commercial building study electrical points, fixtures, and dimensions of fixing fixtures.	
7	Case study of existing house (G+1) to understand plumbing, sanitation, drainage and electrical layout. Visit a bungalow and make layout as existing and also identify supply of main water connection , electricity connection and sewer connection if any	
8	Draw layout for plumbing services for house (G+1)	
9	Draw a detail layout of internal plumbing layout of toilet with sanitary fixtures for	

	house (G+1).	
10	Draw a storm water drain layout of house (G+1) and surrounding	

9. LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Bureau of Indian Standards	National building code of India 2016 Volume 2	
2	Aly S. Dadras , N.C.A.R.B.	Electrical systems for architects	McGraw –Hill, Inc.
3	S.C. Rangwala	Water supply and sanitary Engineering	Charotar Publishing House pvt. Ltd.
4.	Sushil Kumar	Building construction	Standard Publishers Distributers

(AR404) FUNDAMENTALS OF STRUCTURES

1. COURSE OBJECTIVES: In contemporary design, mainly as a result of significant development of science and technology, as well as the ever-increasing size of modern buildings, the role of a structure began visibly determine an architecture of the building. There was also a division of roles in the design process of the building, which usually involve both architects and engineers-constructors. Modern design requires mastering the basics of technical disciplines necessary to understand the role and work of the structure, and thus: theoretical mechanics, structural components and strength of structural materials, including theory of structures and rehabilitation of structures.

The main aim of the course is to enable the understanding of the mechanical response of the structure to the loads acting on it and rehabilitation of structures. Without minimal knowledge in this field, architectural designs will often arise, which either cannot be implemented or will be improper in terms of construction.

2. TEACHING AND EXAMINATION SCHEME:

Semester	IV				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			H	Theory Marks		Practical Marks		Total Marks
(AR404) FUNDAMENTALS OF STRUCTURES		L	T	P		TH	TM	TW	PR/OR	
		3	-	-	3	75	25	-	-	100

3. COURSE OUTCOMES

On completion of this course the student will be able to:

1. Identify loads, magnitude and direction of resultant/ equilibrant force of a system of forces acting on a body
2. Understand centroids and centre of gravity of simple Sections and built up sections
3. Classify structures into load bearing and framed structure and draw sketches of structural elements and list out properties of structural material and find strengths using lab tests as per IS standards
4. Apply methods of preventions and remedies for rehabilitation of structures

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	1	2	-	-	-	-	3
CO2	2	2	-	-	-	-	3
CO3	2	-	2	2	1	2	3
CO4	2	2	2	-	2	2	3

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

Directorate of Technical Education, Goa State

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health, safety, sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	2	2

5. DETAILED COURSE CONTENT/ MICRO-LESSON PLAN

M = Marks Thr = Teaching hours CO = Course Objectives			
UNITS	Mks	Thr	CO
1. LOADS, FORCES AND EQUILIBRIUM	18	12	CO1
1.1 Introduction to types of forces, like Dead load, Imposed load, Wind load, Earthquake load, Hydrostatic load, Internal forces and external forces, SI units, IS codes for loads	5	2	
1.2 force and force system	2	1	
1.3 resolution of forces into components	2	3	
1.4 Calculation of resultant of concurrent forces using parallelogram law and method of resolution	5	5	
1.5 Moment of force, couple and characteristics of couple	4	1	
2. CENTROIDS AND CENTRE OF GRAVITY	14	8	CO2
2.1 Definition of centroid and Centre of Gravity	2	1	
2.2 Centroid and CG of regular areas and volumes	2	1	
2.3 Determination of centroid of built sections like I, L, T, [sections	5	3	
2.4 Determination of CG of simple built up solids	5	3	
3. INTRODUCTION TO STRUCTURES	14	8	CO3
3.1 Types of Structures - load bearing structure and framed structure	2	2	
3.2 Components of load bearing structure and R.C. C. framed structure	4	2	
3.3 One way spanning slabs and two way spanning slabs	2	1	
3.4 Long column and short columns	2	1	
3.5 Masonry structure- corbelling, arches, vaults and domes	4	2	
4. INTRODUCTION TO STRUCTURAL MATERIALS	14	10	CO3
4.1 Properties of structural material like concrete- grades of concrete, strengths of concrete, permissible strengths as per IS standards (IS 456)	5	4	
4.2 Concrete mix design, nominal mix, water cement ratio, factors affecting concrete mix design	5	3	
4.3 Structural steel – types of steel, strength in tension, impact loading	4	3	
5. REHABILITATION/ REPAIRS OF STRUCTURES	15	10	CO4
5.1 classification of cracks in a building- structural and non- structural	1	1	
5.2 types of structural cracks- tensile and shear cracks	2	2	

Directorate of Technical Education, Goa State

5.3 Causes of cracks in buildings – moisture content, creep, thermal changes, elastic deformation, foundation movement, chemical reaction, settlement of soil, vegetation growth	4	3	
5.4 Prevention of cracks- choice of materials, specifications, good architectural ,structural design and foundation design	4	2	
5.5 Remedies to repair the cracks	4	2	
Total	75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures,

class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Loads, forces and equilibrium	12	18
2	Centroids and centre of gravity	8	14
3	Introduction to structures	8	14
4	Introduction to structural materials	10	14
5	Rehabilitation/ repairs of structures	10	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1.	Solve numerical problems on finding resultant and equilibrant
2	Solve numerical problems on centroids and centre of gravity
3	Sketches on load bearing and framed structure and their components like footings, columns (long and short) , beams, slabs (one way and two way), corbelling. Arches and vaults and domes
4	Laboratory test like tension test, compression test and impact test on materials
5	Draw Sketches of remedies for rehabilitations of structures

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Ashok K. Jain,	Strength of materials and Structural Analysis	Nem Chand & Bros. Roorkee
2	R. S. Khurmi	Engineering mechanics	Khanna publication
3	F. P. Beer & E. R. Johnston	Mechanics of Materials,	McGraw-Hill Book Company New Delhi
4	Ashok K. Jain,	Strength of materials and Structural Analysis	Nem Chand & Bros. Roorkee
5	B L Gupta and Amit Gupta	Repairs and Maintenance of civil structures	
6	Arora and Bindra	Building construction	

1. COURSE OBJECTIVES: The students need to gain basic surveying skills. Hence the course is designed to develop the surveying skills required for Architectural Engineering and the ability to use basic surveying equipment, preparing topographical map and contour maps to enable the student to prepare different types of maps of the areas and to equip them well to handle site layouts and other construction works.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			H	Theory Marks		Practical Marks		Total Marks
(AR405) SURVEYING		L	T	P		TH	TM	TW	PR/OR	
		-	-	2	2	-	-	25	25	50

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify the different types and methods of survey and their instruments to be used for land measurements and levelling.
2. Describe different methods of surveying and levelling, plotting of the survey works.
3. Prepare plans and calculate, land areas for basic land surveying, maps and sections.
4. Conduct survey exercises for various terrains/topography using appropriate instruments.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	1	1	-	3	-	1	2
CO2	2	2	2	3	2	2	2
CO3	2	2	3	2	2	3	2
CO4	3	3	3	3	3	2	2

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	1	1
CO2	2	2
CO3	3	2
CO4	2	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives	
Unit	M	Thr	CO
UNIT 1. TYPES OF SURVEYS	3	4	CO1
1.1 INTRODUCTION Definition. Objects of surveying, Principles of surveying. Uses of Survey, Conventional signs related to survey:		2	
1.2 CLASSIFICATION OF SURVEYING classification of surveying, types of primary surveying (plain, geodetic) secondary surveying (Based on instruments),		2	
UNIT 2. BASIC SURVEYING	8	10	CO2
2.1 BASIC INSTRUMENTS FOR LINEAR MEASUREMENT Study and use of instruments for linear measurements – chain, tape, ranging rod, arrows, pegs, cross staff, optical square, and line ranger.		1	
2.2 MEASURING TECHNIQUES Direct and indirect ranging, linear measurements on plain and sloping grounds, Triangulation — Survey Station and their Selections, Survey lines, Check lines, Tie lines, base line. Taking offsets, perpendicular offset and inclined offset. Finding area of field using tape & cross staff		3	
2.3 OBSTACLES AND ERRORS Obstacles and errors in linear measurements.		1	
2.4 COMPASS SURVEY Components, Construction, and use of Prismatic compass Bearing of lines – meridian –true, magnetic, and arbitrary. Bearing (fore-bearing, back bearing, whole circle bearing, quadrantal bearing system and reduced bearing), conversion of bearings, finding included angles from bearings, local attraction-causes, precaution & correction		3	
2.5 TRAVERSING (Brief description only) Open traverse, closed traverse, check on open and closed traverse.		2	
UNIT 3. LEVELLING	6	8	CO2, CO3, CO4
3.1 INTRODUCTION (Definition only) Level surface, level line, horizontal line, vertical line, datum surface, reduced level, benchmark & its types- temporary, permanent, GTS benchmark. Fore sight, back sight, Intermediate sight, change point and height of collimation.		4	
3.2 INSTRUMENTS (sketch and brief description only) Dumpy level, Tilting Level, Auto Level & Levelling staff (Telescopic type only); fundamental axes of dumpy level, Total Station: Demonstration of Total Station , Measurement of Levels in Building Elevation		2	

Directorate of Technical Education, Goa State

3.3 CLASSIFICATION OF LEVELLING(sketch and brief description only) Simple, differential, profile levelling and cross-sectioning, fly levelling, Height of Instrument method, rise and fall method, arithmetic checks, problems in H.I. method only. Recording in levelling book, Sources of errors, precautions to eliminate the errors		2	
UNIT 4. CONTOURING	4	5	CO2, CO3, CO4
4.1 INTRODUCTION (Definition only) Contour, contour interval, horizontal equivalent		1	
4.2 CONTOURING Characteristics of contours, method of contouring – Direct and Indirect methods. Interpolation of contours (arithmetic interpolation method only). Uses of contour maps.		4	
UNIT 5. PLANE TABLE SURVEY	4	5	CO2, CO4
5.1 INTRODUCTION Principles of plane table survey. Accessories required, Telescopic Alidade, Setting out of plane table, levelling, Centering and orientation. Merits and Demerits of plane table Surveying. Situations where plane table survey is used.		2	
5.2 METHODS OF PLANE TABLE SURVEYING Surveying by methods of Radiation and Intersection.		3	
Total	25	32	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, practical. Passing percentage 40%.Term work consist of prescribed number of sheets and shall be progressively assessed

7. SUGGESTED PRACTICAL/EXERCISE& PRACTICALS HOURS

No	PRACTICALS (any10)	Marks	APPROX HOURS REQUIRED.
1	Study of different instruments for linear measurements.	* Please Refer note	2
2	Measurement of area by tape and cross staff survey.		2
3	Study of compass Measuring fore bearing and back bearing for traverse (5 to 6 sided).(drawing sheet)		4
4	Study of dumpy level		2
5	Profile levelling and cross-sectioning.(drawing sheet)		6
6	Fly levelling method.		2
7	Contouring by direct method of a small area.(drawing sheet)		6
8	Contouring by indirect method of a small area		4
9	Plane table survey Radiation,		2
10	Plane table survey Intersection		2

Directorate of Technical Education, Goa State

	Optional practicals (against practical no .6,9,10)		
11.	Study and use of Theodolite (Reading the Vernier and working out the least count, measurement of horizontal angles by repetition method.)		2
12.	Demonstration of Total Station.(Measurement of Levels in Building Elevation		2
13	Study and use of planimeter and practice on measurement of areas.		2
	<i>Note: Proportionate marks distributed for each practical (at least 10 required)</i>	25 marks	

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	APV-CT	Lecture and Practical Notes on Surveying II for polytechnic students	ACTXAN-Verna
2	N.N.Basak	Surveying And Levelling	Tata McGraw-Hill
3	Dr. B. C. Punmiya	Surveying And Levelling Part I And II	Laxmi Publication
4	T .P. Kanetkar & S. V, Kulkarni	Surveying And Levelling Vol. I And II	Pune VidhyarthiGrihaPrakashan
5	S. K. Duggal	Surveying And Levelling Vol. I And II	Tata McGraw-Hill

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	Video cassettes or cd's of above experiments.	If any
2	NPTEL	Video cassettes or cd's of above experiments.	If any

1. COURSE OBJECTIVES: The students need to be competent to work in a Building information modelling software. Hence the course enables the students to be able to understand and model in BIM software; Revit, inter-relate building drawings systematically to its volumetric parameters and develop comprehensive drawing management through in-built features of the software.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
		L	T	P		TH	TM	TW	PR/OR	
(AR406) COMPUTER GRAPHICS-II		-	-	4	4	-	-	50	50	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Model building components in Revit as per the given details.
2. Model a house upto Ground + 1 in Revit as per given design.
3. Render a house upto Ground+ 1 in Revit to achieve the required graphical output.
4. Prepare a sheet layout in Revit as per required format.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	-	1	2	3	1	-	1
CO2	-	1	2	3	2	-	2
CO3	-	-	-	3	2	-	1
CO4	-	-	-	3	2	1	1

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	3	1
CO2	3	1
CO3	3	1
CO4	3	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Thr	CO		
1. REVIT BASICS	10	13	CO1		
1.1. Basics -Building Information Modelling; Revit types; Revit Architecture ; Revit File Types	-	1			
1.2. Exploring User Interface	-	1			
1.3. Building Elements	1	1			
1.4. To Start a Project	-	1			
oDrawing Aids, Project Units	1	1			
oLevels ; Adding Levels ; Modifying Levels ;Creating New Level Element Type; Constrain Level lines ; Remove Constrains ; Remove Level lines	1	1			
oGuide Lines					
1.5. Drawing a plan as per Dimension	2	2			
1.6. Creation of basic Walls: Location Line; Creating Walls; Tips for Creating Wall	1	1			
1.7. Walls in detail: Compound Structure , Wall Layer Wrappings joins ,Vertically Compound Walls ,Wall Shapes and Openings	1	1			
1.8 Sweeps and Reveals	1	1			
1.9. Modify Tools: Move, Copy, Paste, Create Similar, Rotate, Mirror, Array, Scale, Split Element, Trim, Align, Offset, Pin, Unpin ,Delete	1	1			
1.10. Dimensions: Temporary Dimensions, Permanent Dimension, Creating Custom Dimension Type, Modify Dimensions ,Constrains	1	1			
2. MASSING AND FAMILIES	5	6	CO1		
2.1. Massing: Create Mass Family using Forms, Extrusion, Loft, Revolve, Sweep, Swept Blend	1	1			
2.2. Forms and surfaces: Modifying Forms, Dimensioning Forms, Surface Forms, Rationalizing Surface, Surface Representations, Surface Sub regions,	1	1			
2.3. Placing Mass Instance from Mass Family: Creating Building Elements from Mass Instance, Mass Floor, Creating Wall, Creating Floors, Curtain System, Creating Roof, Updating Face- based Host Shapes, Controlling Visibility of Mass Instances	1	2			
2.4. Family Creation: Introduction, Creating 2D door Family, Creating the Door panel Solid geometry, Creating Swing Door Family, Window Family creation, Creating Swing Door Family, Creating Arched Window, Creating Furniture Family	2	2			
3. BUILDING AND SITE COMPONENTS	20	26	CO2		
3.1. Door/ Window ;	2	2			

Directorate of Technical Education, Goa State

Match Type ,Tape Measure, Keyboard Shortcuts ,Visual Styles			
3.2. <u>Floor</u> : Adding Floor, Editing Floor Sketch ,Sloped Floor ,Floor Slab Edges	2	2	
3.3. <u>Ceiling</u> : Creating Ceiling	1	1	
3.4. <u>Roof</u> : Roof by Footprint; Roof by Extrusion; Shape editing for Floors and Roofs; Join/Unjoin Roof, Roof Soffit ,Roof Fascia, Roof Gutter,	2	3	
3.5. <u>Opening</u> : on Face and Vertical opening, Shaft Opening, Wall Opening ,Dormer Opening,	1	2	
3.6. <u>Stairs</u> :Creating Stairs, Creating Stair by sketching Runs, Creating Stair by sketching Boundary and Riser, Spiral Staircase, Stair Calculator, Specifying Railing Types for New Stairs, Modifying Stair, Ramp,Railings, Adding Railing, Modifying Rail Structure, Modifying Rail Joins	2	3	
3.7. <u>Staircase Customization</u> : Stair Nosing, Custom Handrail, Custom Balusters, Family Creation with Adaptive Components,	1	2	
3.8. <u>Structural Modelling</u> : Structural Column, Beams,, Beam System Brace, Trusses, Opening in Structural Elements, Structural Walls, Foundations, Structural Floor	2	3	
3.9. <u>Site Design</u> : Toposurfaces, Subregion, Split Surface, Merge Surface, Building Pad, Graded Region, Parking Components, Site Components ,Contour line Labels	2	2	
3.10. <u>Curtain wall</u> : Creating Curtain Wall, Curtain Grids, Mullions, Reshaping Curtain Wall Panels, Merging Curtain Grids, Adding Curtain Door Panel, Embedded Walls	2	2	
3.11. <u>Detailing</u> : Creating Detail View, Drafting View, Inserting Detail Component	2	3	
3.12 <u>Components</u> : Placing Component, Rehosting, Work plane based and Face based Placement	1	1	
4. VIEWS AND RENDERING IN REVIT	10	13	CO3
4.1. <u>Managing Views</u> : Floor plan views, Ceiling plan view, View properties, View Range, Plan Region, Elevation view, Cut a view by Far Clip Plane, Section View, Creating Section head, 3D views ,Cropping a View	2	3	
4.2. <u>Visibility or Graphics Display</u> : Specifying Element Category Visibility ,Overriding Graphics Display of Element, Overriding Visibility and Graphics Display of Individual Elements	2	3	
4.3. <u>View Templates</u>	2	2	
4.4. <u>Lights</u> : Adding Lighting Fixtures, Light Groups, Sun settings, Materials,Rendering, Walkthroughs, Export walkthrough in .avi format	2	3	
4.5. <u>Materials</u>	2	2	
5. PREPARING DRAWINGS FOR PRINTING IN REVIT	5	6	CO4
5.1. <u>Sheets</u> : Title Blocks, Adding Sheet, Adding Views on Sheet, Sheet list, Print Setup, Print Preview ; Prepare Approval Plan	1	2	
5.2. <u>Customizing Project Settings</u> : Fill patterns, Line Weight, Line Patterns, Line Styles, Purge Unused, Import/Link, Group	1	1	
5.3. <u>Schedules</u> : Schedule/ Quantities, Material Take Off	1	1	
5.4. <u>Text</u> , Model Text, Tag, Callout Views	1	1	
5.5. <u>Rooms</u> : Schedule keys, Area, Color Schemes, Legend Views,	1	1	
Total	50	64	

6. COURSE DELIVERY:

The Course will be delivered through demonstration, practicals and exercises

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Practice and demonstrate all the Revit basic commands to the faculty	10
2.	Prepare building components using massing and families	5
3.	Model a G+1 house with its components and with a contoured site in Revit	20
4.	Render the G+ 1 house incorporating lights and materials	10
5.	Prepare drawings at the given scale. Compose in given sheet sizes with title block	5
	Total	50

8. LEARNING RESOURCES

Internet and Web Resources

S. No.	Author	Title of web resource	Publishers
1		www.autodesk.com	

Videos and Multimedia Tutorials

S. No.	Author	Title of videos	Publishers
1		Revit tutorials on YouTube	

1. COURSE OBJECTIVES: This course prepares a student to work as a self-employed interior designer or assist an interior designer. The course will enable the student to prepare interior scheme for residential and commercial spaces, supervise the execution and also estimate the cost.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR411) INTERIOR DESIGN		L	T	P		TH	TM	TW	PR/OR	
		3	-	1	4	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Define the scope of interior design, the role and duties of interior designer
2. Describe functional and aesthetics requirements of the given projects in the physical parameters of space.
3. Prepare drawing layout, details and specifications for the interior project
4. Prepare estimate, bill of quantities for the interior project

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	-	-	-	2	1	1
CO2	3	3	1	-	2	2	2
CO3	2	3	3	2	3	3	3
CO4	3	3	2	2	3	3	3

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	1	1
CO2	2	2
CO3	3	2
CO4	3	3

5. DETAILED COURSE CONTENTS

M = Marks	Thr = Teaching hours	CO = Course Objectives	
Unit	M	Th r	CO
1 IMPORTANCE AND SCOPE OF INTERIOR DESIGN	5	4	CO1
1.1 Need of Interior Design. Role, Responsibilities and Functions of Interior Designer	5	4	
• Professional Ethics and Code of Conduct			
• Professional Fees			
2 AESTHETICS AND PLANNING IN INTERIOR	22	19	CO1, CO2, CO3
2.1 Elements and principles of Interior Design –	6	5	
• Planning of A Space, Circulation			
• Furniture Placement Anthropometry			
2.2 Theory of Colour and Texture	6	5	
• Complementary and Analogous Colours – Principles for Harmonizing Colours			
• Considerations - Surface Location, Visual Effect, Psychology-			
• Types of Colour Schemes			
• Types of Textures –Materials for Textures			
• Considerations-Visual Effect, Psychology Application, Schemes And Uses			
2.3 Essentials of Interior Design	10	9	
• Home Décor Accents –Artwork, Idols and Figurines Artefact Decorative Stickers, Artificial Flora, Vases, Wall Papers			
• Furnishings-Fabric Cushions Carpets Curtains Accessories Slip Covers Kitchen Linen			
• Interior Lighting Methods, Lampshades, Fixtures			
• Modular Furniture Availability and Use			
• Drapery, Venetian Blinds Types			
3 TECHNICAL SKILLS	15	13	CO3
3.1 Furniture Details In Timber, Stone And Other Innovative Material Furniture Hardware	6	6	
3.2 Selection/Details Of Panelling, Cladding In Stone Timber	3	2	
3.3 Selection/Construction Details Of Partitions And False Ceiling In Various Innovative Materials.	3	3	
3.4 Floorings-Stone, Ceramic , Carpets, Innovative Flooring Materials	3	2	
4 INTERIOR SERVICES	15	12	CO2, CO3

Directorate of Technical Education, Goa State

4.1 Drainage and Water Supply Services - Bathroom and Kitchen Fixtures and Health faucets - Bathroom Hardware - Pipes and Fittings - Washroom Layout With Graphical Symbols	6	4	
4.2. Ventilation and Air-conditioning - Mechanical Ventilation in Kitchens and Washrooms - Ac Systems –Window Unit, Package Units Split Systems, Vrv System Essentials of Installation - Consideration to Placement of Stabilizer, Trap Door, - Layout Using Graphical Symbols	6	5	
4.3. Fire Protection- Placement of Fire Fighting Equipment's Use of Smoke Detectors Alarms, Sprinklers. Installation And Layout	3	3	
5 .ESTIMATION OF INTERIORS	18	16	CO1, CO3
5.1 Scope And Terminology -- Rate Analysis ,Abstract , Billing ,And Other Related Terms	3	3	
5.2 Measurements and Preparation of Abstract	6	5	
Units of Measurements			
Billing			
Use of Software for Abstract			
Exercises On Furniture's Items Finishes Cost Only On Interiors Doors Windows Quantity			
5.3 Importance of Specification	9	8	
Exercises On Writing Specification			
Total	75	64	

6.COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of hours		Marks
		Lectures	Practical	
1	Importance and scope of interior design	3	1	2
2	Aesthetics and planning in interior	14	5	7
3	Technical skills	10	3	5
4	Interior services	9	3	5
5	Estimation of interiors	12	4	6
	Total	48	16	25
		64		

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
Unit 1	Report on importance and scope of Interior design	2
Unit 2	At least 2nos A3 sheet- 2 plan and elevations options using colour, texture and décor	3
	At least 2nos A3 sheet- 2 - furniture layout options using colour, texture and décor	4
Unit 3	1nos A3 sheet- details of Furniture , partition, false ceiling Design	5
Unit 4	2 nos A3 sheet- case study for washroom for plumbing services	5
Unit 5	Excel sheet- and hard copy submission of estimation and bill of quantities, specification	6
	Total	25
No	Class room Assignments	Marks
1	Market survey of essential of interior design	
2	Case study of Interior layout of any residential space	
3	Case study of Interior layout of any commercial space	
4	Taking measurement of Interior components and finding quantities	
5	Case study of colour schemes and report	
6	Case study on use of texture	
7	Case study of Interiors of kitchen and report	
8	Case study of office interiors up to 30sqm and report	
9	Case study of showroom and report	
10	Market survey on innovative material and availability with prices	
11	Market survey on trendy electrical, plumbing fittings and fixtures	

9. LEARNING RESOURCES

Reference Books

S. No.	Author	Title of Books	Publishers
1	Simon Brake	Interior Design –Beginners Guide	
2	PremavathiSetharaman / ParveenPannu	Interior Design And Decoration	
3	Indian Architectural Group	Contemporary Interiors	
4	Richard Powers& Phyllis Richardson.	Living Modern: The Sourcebook Of Contemporary Interiors	
5	The American Institute Of Architects	Construction Details – Architectural Graphic Standards	John Wiley & Sons ,Inc
6	Nancy Temple	Home Space Planning	Mcgraw Hill International
7	Lloyd And Blackmore	Glass For A Beautiful Home	Premier Editions
8	Lorrie Mack	Making The Most Of Workspaces	Rizzoli ,New York
9	Trevor Lamb &Janine Bourriau	Color Art And Science	Cambridge

Directorate of Technical Education, Goa State

10	Min Hogg & Wendy Harrop	The World Of Interiors	Conran Octopus
11	Mortan Newman	Design And Construction Of Wood Framed Buildings	Mcgraw Hill International
12	Stewart Walton	The Complete Home Decorator	Rizzoli, New York

1. COURSE OBJECTIVES: This course shall introduce the student to the discipline of landscape architecture. It will enable the student to develop landscape designs with an understanding of site parameters and gain knowledge about various landscape components, elements and services. It will also develop the students approach towards holistic site planning.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR412) LANDSCAPE DEVELOPMENT		L	T	P		TH	TM	TW	PR/OR	
		3	-	1	4	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify the functions, scope of work, concepts, components and elements of landscape architecture.
2. Describe the usage of landscape elements, hard and soft components, parameters of site analysis, sustainable planning, construction, infrastructure and management.
3. Conduct a Site analysis based on visual and physical criteria.
4. Prepare a landscape site layout with integration of components, elements and services.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	1	1	-	-	1	1	1
CO2	3	-	-	-	3	1	3
CO3	1	2	-	2	3	2	2
CO4	3	2	3	2	3	2	2

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	2	1
CO2	2	2
CO3	2	3
CO4	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives	
Unit	M	Thr	CO
1 INTRODUCTION TO LANDSCAPE ARCHITECTURE	9	8	CO1
1.1 Introduction to landscape architecture • Need of landscape: functional, aesthetic • Definitions • Scope of work • Role and duties of landscape architect	1	1	
1.2 Historical Background : • Historical landscape designs; Mughal gardens, Japanese, Zen gardens, European gardens	1	1	
1.3. Theory of Landscape Design: concepts	1	1	
1.4. Types of landscapes: • Natural and manmade landscape • Urban and rural landscape	2	2	
1.5. Usage: residential, commercial, industrial areas • Public spaces, courtyards, gardens, traffic islands, parks, play areas, squares, plazas	1	1	
1.6. Representation of Landscape design: • Graphical: denotations for landscape elements, symbols, legends • Types of drawings: Layout, sections, details	3	2	
2 ELEMENTS OF LANDSCAPE ARCHITECTURE	15	13	CO2
2.1 Types of landscape elements:	1	1	
2.2. <u>Components of hard landscape:</u> • Types: Patio, Paving, walkways, driveways, pavilions, decks, steps, ramps. • Materials usage	2	2	
2.3. <u>Components of Soft landscape:</u> • Vegetation: Trees, shrubs, plants ,brief taxonomy • water bodies • earth mounds • Materials usage	2	2	
2.4. Composition of soft and hard landscapes, application in design	1	1	
2.5. Land form: • Natural elements and systems: Contoured, surface drainage • Man-made elements • Modifications in natural system	3	2	
2.6. Water bodies: pools, water features	1	1	
2.7. Installations: pergola, screen walls, fountains, canopies, gazebo, materials	1	1	
2.8. Outdoor furniture: inbuilt seats, Street furniture, materials	1	1	

Directorate of Technical Education, Goa State

2.9. Case studies of landscape elements : Application in design	3	2	
3 SITE ANALYSIS AND PLANNING	30	24	CO2, CO3, CO4
3.1 Introduction to Site analysis and Site planning	3	2	
3.2 <u>Site analysis</u> : based on - Physical features: Topographical, water resource, soil conditions, microclimate. - Existing flora, fauna - Existing structures, requirements	5	4	
3.3. <u>Site planning</u> : - Zoning of activities : based on functional, recreation, services, aesthetic requirements - Aesthetic composition: Utilization of Elements and principles of design. - Sustainable planning	5	4	
3.4. Vehicular accommodation: movement, parking spaces, drop-off points	3	2	
3.5. Case Study and analysis of contemporary landscape designs	4	3	
3.6. Case Study of existing landscaped areas like courtyards, gardens, urban spaces etc.,	4	3	
3.7. Application of landscape design for site plans, small gardens, residential areas, urban spaces, courtyards etc.,	6	6	
4. CONSTRUCTION AND INFRASTRUCTURE IN LANDSCAPE	15	13	CO2
4.1. Infrastructure integration into landscape: plumbing, electrical, drainage.	2	1	
4.1 Plumbing: - water supply for vegetation, lawn, water based aesthetic fixture - water supply pipes: concealed - Sustainable fixtures :to prevent water wastage	3	3	
4.3: Electrical: - wiring ducts: concealed - Fixtures: on ground, installed above ground as element - Sustainable fixtures: solar powered light fixtures	3	2	
4.4. Drainage: - Retain top soil - Channelizing of rain water - Sustainable features: Reutilization of surface run-off	3	3	
4.5. Sustainable techniques and technologies Vertical gardens, terrace gardens, organic farming	4	4	
5. MANAGEMENT OF LANDSCAPE PROJECT	6	6	CO2
5.1. <u>Scope of work</u> - civil, landscape - Site work, Setting out - Construction technique - Supervision	3	3	
• Estimation	3	3	
Total	75	64	

6. COURSE DELIVERY:

The Course will be delivered through lectures, PowerPoint presentations, class room interactions, site visits and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of hours		Marks
		Lectures	Practical	
1	Introduction to landscape architecture	6	2	3
2	Elements of landscape architecture	10	3	5
3	Site analysis and planning	18	6	10
4	Construction and infrastructure in landscape	10	3	5
5	Management of landscape project	4	2	2
	Total	48	16	25
		64		

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	The student will be required to prepare a report on the importance of landscape architecture and historical examples.	3
2.	The student will have to conduct a case study and prepare and explain a PowerPoint presentation on the Elements landscape design.	5
3.	The student will have to conduct an internet case study on any 2 examples of contemporary landscape design.	2
4.	The student will have to conduct a case study (<i>of at least 2</i>)existing landscaped areas like courtyards, gardens, urban spaces etc.	3
5.	The student will have to prepare a landscape design layout for the given project and present it in colour. (<i>layout plan ,2 cross –sections, detail views</i>)	5
6.	The student will have to visit a landscaped site and make a list of its civil works, plumbing, electrical and drainage components.	3
7.	The student will have to prepare an internet based case study on emerging sustainable techniques and technologies.	2
8.	The student will have to write a short note on at least 10 management works involved in the construction of a landscape project.	2
	Total	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Michael Littlewood	Landscape Detailing Volume 2 Surfaces	CBS PUBLISHERS & Distributers
2	Roger Sweetinburgh	Small Garden Planner	Chancellor Press
3	Herb Gustafson	The Art of Japanese Gardens	Sterling Publishing Cb., Inc. New York
4	Rahoul B. Root	Gardens of Delight	Lustre Press
5	James B. Root	Fundamentals of Landscaping & Site Planning	The AVI Publishing Company Inc. Westport, /Connecticut
6	Geoffrey and Susan Jellicoe	The Landscape of Man	Thames and Hudson
7	Charles W Harris and Nicholas T. Dine	Time Saver Standards for Landscape Architecture	Mcgraw – Hill, International Edition, Arch. Series

Directorate of Technical Education, Goa State

(AR413) SUSTAINABLE ARCHITECTURE

1. COURSE OBJECTIVES: The students need to possess the knowledge and skills to contribute towards building a sustainable built environment in their Architectural practice. Hence this course will enable the students to understand the concept of sustainable architecture and gain adequate knowledge about its various aspects on site as well as building planning and construction. They will also be aware of selecting sustainable materials & construction techniques for construction, and finishing.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR413) SUSTAINABLE ARCHITECTURE		L	T	P		TH	TM	TW	PR/OR	
		3	-	1	4	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Choose sustainable approach integrally while conceptualizing, developing design and execution for architectural project.
2. Describe the concept and parameters of sustainable site and building planning, construction, water conservation, energy efficiency and sustainable building materials and resources.
3. Prepare design drawings of a project; integrating sustainable site and building planning features, and service layouts incorporating water conservation features and electrical efficiency.
4. Supervise the material management and construction procedures on site to incorporate sustainable practices.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	1	1	-	3	3	1
CO2	3	2	2	-	3	3	3
CO3	3	3	3	1	3	3	3
CO4	3	3	3	2	3	3	3

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	3	2
CO4	2	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives		
Unit	M	Thr	CO	
1. INTRODUCTION TO SUSTAINABILITY	10	8	CO1	
1.1. Introduction : Definition of the term , scope - o Green building v/s Conventional Building - o Benefits: tangible, intangible - o Use of national standards as baselines; NBC , ECBC, RECs, UPC, Guidelines :MoEF, CGWB, CPCB	3	3		
1.2. Life Cycle Sustenance	2	1		
1.3. Integrated design approach	3	3		
1.4. Rating systems: modules, parameters, certification e.g.: Indian Green Building Council (IGBC) rating system, GRIHA Teri	2	1		
2. SUSTAINABLE ARCHITECTURE AND DESIGN	30	26	CO2	
2.1. SITE SELECTION AND PLANNING - o Site selection - o Site assessment prior to design - o Preservation of existing site features- topography, vegetation - o Soil conservation - o Optimize on site circulation efficiency - o Design to include existing site features - o Reduce hard paving on site - o Plan utilities efficiently	5	4		
2.2. BUILDING PLANNING - o Building Form Orientation - o Optimal Day lighting - o Passive Architecture- Natural Ventilation, Cooling and Wind Effect - o Optimize building design to reduce conventional energy demand - o Heat island reduction - o Envelope Optimization - o Universal accessibility	5	4		
2.3. BUILDING CONSTRUCTION - o Sustainable technologies - o Reduce air pollution during construction - o Sustainable construction management - o Construction phase material storage and handling	5	4		
2.4. CASE STUDIES: E.g. CII- Sohrabji Godrej Green Building Centre, Hyderabad ;commonwealth Games village, New Delhi, Suzlon- One earth, Centre for environmental science and Engineering buildings (CESE) at IIT Kanpur, RETREAT Complex, Haryana, TERI university, Delhi, TERI Bangalore, TERI Mukteshwar building,	15	14		

3. WATER CONSERVATION	15	13	CO3
3.1 WATER MANAGEMENT ○ Ensure water quality ○ Reduce water use by building ○ Water efficient plumbing fixtures ○ Efficient water use during construction ○ Reduce landscape water requirement ○ Waste water treatment ○ Water recycle and reuse (including rainwater)	7	6	
3.2. RAINWATER HARVESTING ○ Surface Runoff	5	4	
3.3. WATER ELEMENTS AND IRRIGATION PRACTICES	3	3	
4 ENERGY EFFICIENCY	5	4	CO3
4.1 . Orientation	2	2	
4.2. Building Envelope measures	3	2	
5 . SUSTAINABLE BUILDING MATERIALS AND RESOURCES	15	13	CO4
5.1.Sustainable building materials	2	2	
5.2.Building reuse	1	1	
5.3.Reuse of salvaged materials	1	1	
5.4. Materials with recycled content	3	3	
5.5.Local materials	3	3	
5.6.Wood base materials	3	2	
5.7.Handling of material waste during construction	2	1	
	75	64	-

6. COURSE DELIVERY:

The Course will be delivered through lectures, Power points, videos, class room interactions, case studies, assignments.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of hours		Marks
		Lectures	Practical	
1	Introduction to sustainability	6	2	3
2	Sustainable architecture and design	19	7	10
3	Water conservation	10	3	5
4	Energy efficiency	3	1	2
5	Sustainable building materials and resources	10	3	5
	Total	48	16	25
		64		

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	The student will have to prepare a poster supporting Green building movement in India. (A1size)	3
2.	The student will have to prepare and present a Case study on any one Green Building stating its sustainable features	10
3	The student will have to conduct a market survey and submit a report on water efficient plumbing fixtures (A4 size)	5
4.	The student will have to take any existing building and suggest corrective measures on building envelop to enhance energy efficiency (1 page)	2
5.	The student will have to conduct a market survey and submit a report on sustainable building materials available. (A4 size)	5
Total		25

9. LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Bureau of Indian Standards	National building code of India 2016 Volume 2	
2		Griha Manual- Volume 1	Ministry of New and renewable energy, Government of India and Teri
3		Indian Green Building council(IGBC) Manual	

Internet and Web Resources

S. No.		Website/ pdf	
1		IGBC GREEN New Building Rating system (Version 3.0) pdf	
2.		https://igbc.in	
3.		www.igbc.in	
	NCTEL	Videos of Rural Development Department	

1. COURSE OBJECTIVES: The students need to recognize the value of built heritage. Hence this course introduces the student to the field of Architectural Conservation. It discusses the need and types of conservation; the necessity of documentation and as well appropriate techniques of conservation. It also gives the students an overview of design considerations in a heritage area.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
(AR414) ARCHITECTURAL CONSERVATION		L	T	P		TH	TM	TW	PR/OR	
		3	-	1	4	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Define the terminologies related to conservation.
2. Describe basic types, methods of architectural conservation and its techniques.
3. Prepare the database required for conservation of heritage buildings.
4. Develop the architectural facades and details of buildings in heritage structures considerably.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	2	2	2	3	3	3
CO2	3	3	3	2	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	1	1
CO2	2	2
CO3	3	2
CO4	3	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives		
Unit	M	Thr	CO	
1. INTRODUCTION TO ARCHITECTURAL CONSERVATION	20	18	CO1	
1.1. Definition and terminologies: authenticity, preservation, conservation, heritage, restoration, renovation.	8	8		
1.2. Role of conservation architect, structural engineer				
1.3. Heritage and society.	2	2		
1.4. Need , scope and purpose of conservation	2	2		
1.5. Issues of heritage areas: a. Deterioration: biological, chemical, physical , climatic b. Material and Structural failure c. Man-made causes: economical	2	2		
1.6. Challenges: preservation of authenticity (through technique, material, character), lack of man-power, traditional techniques, lack of information.	3	2		
1.7. Opportunities, potentials, eg. adaptive reuse				
1.8. International and national bodies: Role of UNESCO, other allied bodies and institutions, ASI, INTACH and their role in conservation.	3	2		
1.9. Examples of World Heritage sites				
2. TYPES OF ARCHITECTURAL CONSERVATION	10	10	CO2	
2.1.Introduction to types of architectural intervention. a. Prevention of deterioration in heritage buildings. b. Preservation of the existing building. c. Consolidation of the fabric d. Restoration e. Case studies of each type.				
3. DOCUMENTATION IN ARCHITECTURAL CONSERVATION	15	12	CO3	
3.1.Introduction to heritage documentation: surveys, measured drawings-buildings and architectural details, heritage listings, inventories, sketching	7	6		
3.2.Measured Drawing: Preparation, development and presentation. (manual and computerised)	6	5		
3.3. Photographic/ Video graphic documentation	2	1		
4. INTERVENTIONS IN EXISTING HERITAGE CONTEXTS	15	12	CO4	
4.1.Heritage areas -parameters to consider: Suitability to context, architectural style and details, authentic character.	2	2		

Directorate of Technical Education, Goa State

4.2. Related byelaws, policies, conservation committees.	3	2	
4.3. Local guidelines for preservation, conservation and restoration of heritage structures, its facades and details.	5	4	
4.4. Local guidelines for new buildings in historical setting.	5	4	
5. INTRODUCTION TO MATERIALS, METHODS AND CONSTRUCTION TECHNIQUES	15	12	CO2
5.1. Preliminary field investigation , Safety considerations	2	2	
5.2. Traditional building materials a. Structural: eg: Earth, clay, stone, brick, timber, bamboo, lime, iron b. Non-structural: mortars, renders, paints and plasters	5	4	
5.3. Historic building technology, structure and construction systems	5	4	
5.4. Traditional master-masons, building craftsmen			
5.5. Retrofitting, strengthening and upgradation	3	2	
	75	64	

6. COURSE DELIVERY:

The Course will be delivered through lectures, Power points, videos, class room interactions, site visits, case studies, assignments, guest lectures of conservation architects, local traditional workers/craftsmen.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of hours		Marks
		Lectures	Practical	
1	Introduction to architectural conservation	13	5	7
2	Types of architectural conservation	8	2	3
3	Documentation in architectural conservation	9	3	5
4	Interventions in existing heritage contexts	9	3	5
5	Introduction to materials, methods and construction techniques	9	3	5
	Total	48	16	25
		64		

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	The students will prepare a report on Unit 1. about introductory parameters of Architectural conservation.	7
2.	The students will prepare a presentation in groups on different types of Architectural conservation. Each group to be given a different topic and submit a report on the same.	3
3.	The students will collect copies of measured drawings and related documentation of any one heritage structure. They will prepare a report highlighting the various components of the drawing and documents.	5
4.	The students will study the local building guidelines for conserving the elevation of heritage structures and for designing a new structure in a heritage area. They will develop the street facing elevation for an old dilapidated structure in a Goan streetscape and present it in colour.	5

Directorate of Technical Education, Goa State

5.	The student will make a report on traditional building materials and construction systems.	5
Total		25

9. LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1		The Goa Regulation of Land Development and Building Construction (latest prevalent regulations)	Government Printing press
2	Conservation of Historic Buildings	Fielden, Bernard, 2003,	Architectural Press.
3	Guidelines for Conservation	Fielden, Bernard, 1989	INTACH, New Delhi.
4.	Conservation of Historic Buildings	Fielden, Bernard, 2003,	Architectural Press.
5.	Guidelines for Conservation	Fielden, Bernard, 1989	INTACH, New Delhi.
6.	Historic England, Practical Building Conservation: Conservation Basics,		2013, Routledge.
7.	Contemporary Theory of Conservation	Salvador Munoz-Vinas, 2005	Elsevier.
8.	Recording, Documentation, and Information Management for the Conservation of Heritage Places- Guiding Principles	Letellier, Robin, , 2007	Getty Conservation Institute. Los Angeles.

Internet and Web Resources

S. No.	Website/ pdf
1	www.intach.org
2.	en.unesco.org
3.	http://asi.gov.in/

DIPLOMA IN ARCHITECTURAL ASSISTANTSHIP- CURRICULUM STRUCTURE for SEM V											
Semester	Code	Subjects	L	T	P	H	TH	TM	PR	TW	TOT
FIFTH	AR501	Architectural Working Drawing	-	-	8	8	-	-	75	100	175
	AR502	Estimation and Costing	3	-	2	5	75	25	-	25	125
	AR503	Building Services-II	3	-	2	5	75	25	-	50	150
	AR504	Basics of Structural Design	3	-	2	5	75	25	-	25	125
	AR511,AR512,AR513,AR514	Elective Group E2	3	-	2	5	75	25	25	25	150
	CC501	Entrepreneurship Development	-	-	2	2	-	-	-	25	25
	AC101,	Essence Of Indian Knowledge And Tradition	2	-	-	2	-	-	-	-	-
			14	-	18	32	300	100	100	250	750
L- Lecturers T – Tutorial P – Practical C-Credits TH – Theory Marks TM – Test Marks PR – Practical Marks TW- Term Work Marks											

Elective Group E2	
AR511	Site Supervision & Management
AR512	Professional Practice
AR513	Building Services Management
AR514	Advanced Mathematics – Arch.

(AR501) ARCHITECTURAL WORKING DRAWING

1. COURSE OBJECTIVES: As the following Sem. VI will be Architectural Training; the students need to be competent to prepare the type of drawings expected in office; especially technical drawings like submission drawing and working drawings. Hence the course will enable the students to reinforce technical knowledge and skills by applying to complex projects. They will also be able to coordinate multi-faceted parameters in building projects and identify and resolve discrepancies in technical projects with systematic approach.

2. TEACHING AND EXAMINATION SCHEME

Semester	V				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
		L	T	P		TH	TM	TW	PR/OR	
(AR501) ARCHITECTURAL WORKING DRAWING		-	-	8	8	-	-	100	75	175

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand the significance, parameters and methodologies for the preparation of computerized technical drawings.
2. Prepare computerized approval drawings with area computations and comprehensive working drawing set of a multi-storeyed building.
3. Develop co-related detailed working drawings set conducive for effective communication and systematic implementation on site.
4. Supervise construction of building project co-related with complete working drawing set and its specifications.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	2	2	2	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	3	3

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	2	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 SUBMISSION DRAWING OF A GROUND + 1 STRUCTURE			20	26	CO1, CO2
1.1 Submission drawing – Review of Sem III, Unit 5 Introduction to various planning and development authorities .i.e: PDA, TCPO, Panchayat, Municipal corporation			-	2	
1.2 Computerized submission drawing: :contents with appropriate aspects, scale			-	2	
1.3. Area Statement and schedule of openings			2	5	
1.4 -Area calculations –from computerised area diagrams			3	5	
1.5. Preparing the drawing on AutoCAD to scale			15	12	

2 WORKING DRAWINGS -General arrangement	45	58	CO3, CO4
2.1 Working drawings of multi-storeyed building structures: Introduction, significance, terminology, types of drawings (structural drawing, MEP consultant drawings, shop drawings),	-	2	
2.2 Overlay of consultant /shop drawings with base drawing	5	2	
2.3 Scope, methodology, working drawing index, specifications.	-	2	
2.4.Setting out plan	4	8	
2.5.Center line plan	5	8	
2.6.Floor plans- ground	5	8	
2.7.Higher floor Plan	5	6	
2.8. Roof plan	3	3	
2.9.External elevation (minimum 1)	5	6	
2.10 Sections (minimum 2)	8	11	
2.11 Supervision on site	5	2	
3. WORKING DRAWINGS –Component and sub- component and assembly drawings	10	12	CO3, CO4
3.1. Component and sub- component and assembly drawings: Introduction, terminology, specifications	-	1	
3.2. Appropriate scales of component and sub- components, selection of details (given by concerned faculty)	-	1	
3.3. Doors/ windows with schedule	2	1	
3.4.Staircase details	4	3	
3.5.Balusters/ railings details	1	1	
3.6.Grill/ Gate details	1	1	
3.7.Compound wall details	1	2	
3.8. Supervision on site	1	2	
4 WORKING DRAWINGS –Services layout	15	20	CO3, CO4
4.1 Electrical layout	4	6	
4.2 Plumbing layout (water supply and sanitary)	3	5	
4.3 Toilet layouts : with sectional elevations	6	7	
4.4. Supervision on site	2	2	
5 WORKING DRAWINGS –Interior layouts	10	12	CO3, CO4
5.1 Interior working drawing: introduction, alternative units (feet, inches),	-	1	
5.2. Methodology, accommodation of services.	-	1	
5.3. General arrangement working drawing of Single unit spaces e.g. Kitchen, office.	4	5	
5.4.Detailing of components eg. Built in units, reception desk, False ceiling	4	3	
5.5.Supervision on site	2	2	
Total	100	128	-

6. COURSE DELIVERY:

The Course will be delivered through lectures, PowerPoint presentations, and review of drawings, feedback and computerised drafting practical.

7. SPECIFICATION TABLE FOR PRACTICAL MARKS

No	Practical	Marks
1.	- The student is required to prepare computerized A1 size Submission drawing of the bungalow project designed in Sem III . - Preparation of project Approval file for building License. <i>The drawing to be drafted using computer drafting software, eg: AutoCAD with proper application of line weights, line types, layers, and drawn at relevant scale.</i> <i>Layout space may be used for drawing composition</i>	15
2.	The student will have to overlay a consultant drawing/shop drawings with base drawing and note points of discrepancy and compatibility.	5
	General arrangement: The student is required to prepare a computerized Working drawing set of the given project. 1:50 scale	40
a.	Setting out plan	4
b.	Centreline plan	5
c.	Floor plans- ground	5
d.	Higher floor Plan	5
e.	Roof plan	3
f.	External elevation (min 1)	5
g.	Sections (min 2)	8
h.	Supervision on site	5
3.	Component and sub- component and assembly drawings 1:20	10
a.	Doors/ windows with schedule	2
b.	Staircase	4
c.	Balusters/ railings	1
d.	Grill/ Gate	1
e.	Compound wall	1
f.	Supervision on site	1
4.	Services layout	15
a.	Electrical layout(<i>to be prepared in Xref</i>)	4
b.	Plumbing layout (water supply and sanitary)	3
c.	Toilet layouts : with sectional elevations toilet (1:20)	6
d.	Supervision on site	2
5.	Interior layouts	10
a.	General arrangement (1:20)	4
b.	Detailing of components	4
c.	Supervision on site	2
	Total	100

1. *The scope of work would be finalized by the concerned faculty.*
 2. *No. of sheets as per project requirements*
 3. *All Stages of Technical drawings should be followed compulsorily for **Progressive assessment**.*
 4. *The student would have to submit the work to the faculty as per the deadlines allotted.*
 5. *Computerized drawings drafted to scale; submitted in soft and hard copy.*
 6. *Viva-voce for presentation of Technical Drawings*.*
- Note : Technical Drawings* inclusive of submission and working drawings.*

8. LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Keith Styles and Andrew Bichard	Working Drawings Handbook (Fourth Edition)	Architectural press
2		National Building Code of India 2016 Volume 1	Bureau of Indian Standards
3		National Building Code of India 2016 Volume 2	Bureau of Indian Standards
4.	Joseph De Chiara Julius Panero Martin Zelnik	Time- Saver standards for Housing and residential development	Mc. Graw Hill Education
5.	Joseph De Chiara Julius Panero Martin Zelnik	Time-saver standards for Interior Design and space planning	McGraw –Hill International Editions Architecture series

(AR502) ESTIMATION AND COSTING**1. COURSE OBJECTIVES:**

A student of architectural assistantship is required to have an understanding, knowledge and analytical skills to prepare various types of estimates for civil works and be able to find out the costs of items of works. The course content is designed to provide the student with requisite knowledge in the preparation of estimates for civil works and for carrying out tendering process and billing.

2. TEACHING AND EXAMINATION SCHEME

Semester	V				Total Hours	Examination Scheme				Total Marks
Course code & course title		Periods/Week (in hours)				Theory Marks		Practical Marks		
						TH	TM	TW	PR/OR	
(AR502) ESTIMATION AND COSTING		L 03	T -	P 02	H 05	75	25	25	-	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. State units of measurement for different item of work, the purpose of estimation and costing; different types of estimates.
2. Understand specifications, the process of estimating the quantities, schedule of rates, bill of quantities, billing and concept of contract and tendering
3. Prepare Analysis of rates for a given item of work, estimate of a building and bills.
4. Examine quotations for award of work, Scrutinize Bills

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific knowledge	Problem Analysis	Design & development of Solutions	Engineering tools, Experimentation and practice	Engineering practices for society , sustainability and Environment	Project Management	Life-long learning
CO 1	3	3	--	--	--	1	--
CO 2	3	2	--	--	3	3	3
CO 3	3	3	3	3	3	3	3
CO 4	2	3	1	--	3	3	3

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	1	--
CO2	3	3
CO3	3	3
CO4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
UNIT 1:- ESTIMATION	6	6			
1.1. General Introduction				1	CO1
1.2. Definition of the term Estimation and costing, purpose of estimation, Qualities and functions of an estimator	3			2	CO1
1.3. Data required for preparing detailed estimates, Factors to be considered for estimation, Various types of estimates i. Plinth Areas ii. Carpet area iii. Cubic content iv. Item wise estimate			3	3	CO1
UNIT 2:- ITEM WISE ESTIMATE:	27	16			

2.1. Different item of works and their specifications	6	3	CO1 CO2
2.2. Units of measurement of different items of works as per IS 1200, limits of measurement and degree of accuracy in estimating different methods for estimating building works,	3	1	CO1 CO2
2.3. Use of measurement sheet and abstract sheet, Schedule of rates.	3	2	CO2
2.4. Estimate of sanitation	3	1	CO3
2.5. Estimate of Electrical Installations.	3	1	CO3
2.6 Detailed estimation of a two room building and a residential building.	6	7	CO3
2.7 Bill of quantities	3	1	CO2 CO3
UNIT 3:- BILLING:	21	12	
3.1 Calculating quantities of works executed on site using different method of measurements	12	7	CO2 CO3
3.2. Preparing bills using different measurement sheets and abstract sheets	9	5	CO2 CO3 CO4
UNIT 4:- RATE ANALYSIS:	12	10	
4.1. Definition of rate analysis, Factors affecting rates of items.	3	2	CO2
4.2. Preparing rate analysis of following items of civil work (i) Cement concrete work, (ii) R.C.C. work, (iii) plastering, (iv) Brickwork and (v) painting	6	5	CO3
4.3. Rate analysis for sanitary and water supplies works	3	3	CO3
UNIT 5:- CONTRACTS AND TENDERING PROCESS	9	4	
5.1 Definition, requirements of valid contracts, forms of contracts, condition of contracts, contract documents, schedule of material supplied by the owners and specification. Security deposit time limit, mode of measurement, terms of payment, execution of work, breach of contract and arbitration	3	1	CO2
5.2 Types of contract- Lump sum contract, percentage rate contract and item rate contract with their merits & demerits	3	2	CO2
5.3 Definition of tender notice, necessary information in the tender notice, submission of tenders, earnest money deposit	3	1	CO4
Total	75	48	-

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies and site visits shall be conducted to familiarise students with billing of items on site.

7.SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	ESTIMATION	6	6
2	ITEM WISE ESTIMATE:	16	27
3	BILLING:	12	21
4	RATE ANALYSIS	10	12
5	CONTRACTS AND TENDERING PROCESS	4	9
	Total	48	75

8.SPECIFICATION TABLE FOR TERM WORK & PRACTICALS MARKS

No	Practical	Marks	Hrs
1	Make students measure with a tape dimensions of civil item of works in the classroom and make them record it in the measurement sheet. a. Painting of Wall/Ceiling/Beam/Column b. Plastering of Wall/ Ceiling/Beam/Column c. R.C.C. Column d. R.C.C. Beam e. R.C.C. Slab f. Aluminium/ Wooden Windows g. Door Frames and Shutters h. Flooring i. Skirting for Wall j. Electrical fixtures	2	2
2	Estimate the quantity of Laterite Stone Masonary in steps leading to the plinth level from the ground level of a residential Bungalow	2	14
3	Preparing estimate of compound wall by long wall short wall method and centre line method	4	
4	Preparing estimate of a commercial / residential type of building using item-wise estimate and their specifications.	8	
5	Preparing bills of various items by taking measurements on site	5	8
6	Rate analysis of different items” I. Cement II. R.C.C. work in beam, slab III. Plastering IV. 1 st class brickwork in superstructure V. Half brick wall VI. Painting	3	6
7	Drafting of Tender Notice	1	2
8	Site Visits shall be conducted to make the students aware of the methods of billing and estimation.		
	Total	25	32

9.LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B.N. Datta	Estimation & Costing in Civil Engineering	UBS Publishers
2	M. Chakraborti	Estimation Costing Specifications & Valuation in Civil Engg	M. Chakraborti Kolkata
3	B.S. Patil	Civil Engg. Contract and Estimation	Orient Longman
4	S. Ramamruthan	Steel Tables	Dhanpat Rai & Company
5	-----	I.S. Codes 1200 part VIII	-----

(AR503)BUILDING SERVICES-II

1. COURSE OBJECTIVES : This course teaches the students the more advanced services related to the building industry, viz. Air conditioning, and acoustics and fire protection. This knowledge would be utilized for working drawings. This would enable the students to prepare layout of air conditioning system, construction details of Thermal Insulation, sound insulation, acoustical design and plan fire prevention and protection of buildings.

2. TEACHING AND EXAMINATION SCHEME

Semester	V									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
(AR503) BUILDING SERVICES-II		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	50	-	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Define the components of HVAC systems, insulation, mechanical vertical transportationsystem and fire safety services for a building.
2. Understand the standards and mechanism related to building services*
3. Prepare AC layout, fire protection layout and building insulation details.
4. Integrate appropriate building services* details in building design.

Note:Building services*- Ventilation and Air conditioning, acoustics, sound insulation, mechanical vertical transportation system, thermal insulation, fire safety

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	1	-	-	-	-	1	1
CO2	2	1	2	-	2	1	2
CO3	2	1	3	1	3	3	3
CO4	3	-	3	-	3	3	3

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	3	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Thr	CO		
1 VENTILATION AND AIR CONDITIONING	30	20	CO1,CO2 CO3,CO4		
1.1. VENTILATION ○ Definition ○ Necessity ○ Factors affecting ventilation ○ Systems of Ventilation- Natural, Mechanical	3	2			
1.1.1 NATURAL VENTILATION ○ General conditions in Natural Ventilation ○ Wind effect ○ Stack effect	4	3			

Directorate of Technical Education, Goa State

1.1.2. MECHANICAL VENTILATION ○ Mechanical ventilation: Advantages, disadvantages ○ HVAC: Air handling unit (A.H.U.), heating ○ Supply, exhaust and air conditioning	5	3	
1.2 AIR CONDITIONING: HVAC			
○ Basic refrigeration cycle ○ Principles of air conditioning ○ classification – according to purpose -according to season	5	3	
○ Systems of Air conditioning (depending on location of a/c unit) components of a/c system including air distribution system,	6	5	
○ Humidification and dehumidification ○ Filtration	3	1	
○ Air conditioning layout	4	3	
2 ACOUSTICS AND SOUND INSULATION	15	9	CO1,CO2, CO3,CO4
2.1 ACOUSTICS ○ Definition and purpose ○ Characteristics of audible sound ○ Acoustical defects	3	2	
○ Requirements and conditions of good acoustics ○ General principles of acoustic design	3	2	
○ Classification of acoustic materials with examples of each.	2	1	
2.2. SOUND INSULATION			
○ Definition and purpose. ○ Noise –types and transmission	2	1	
○ General consideration for noise control	2	1	
○ Constructional techniques used in insulation of walls, floors, windows, doors, sanitary fittings & machinery.	3	2	
3 MECHANICAL VERTICAL TRANSPORTATION SYSTEM	5	3	CO1,CO2, CO4
○ Definition, need, purpose	-		
3.1 Lifts location, precautions ○ Types of elevators ○ Gearless traction elevators ○ Hydraulic elevator ○ Residential elevators(Plan and section) ○ Panoramic elevator, drawings(Plan and section) ○ Dumbwaiters ○ Lifts with and without machine room ○ Car lifts, Stack parking ○ Lifts and fire safety. ○ Civil works of residential elevator	3	1	
3.2.Escalators ○ Introduction, advantages, disadvantages, mechanism	1	1	
3.3.Introduction to cleaning devices: mechanical, horizontal,vertical	1	1	

Directorate of Technical Education, Goa State

4 THERMAL INSULATION	10	6	CO1,CO2, CO3,CO4
4.1 INTRODUCTION TO THERMAL INSULATION ○ Definition of related terms ○ Objectives ○ Advantages	2	1	
4.2 General Principles of Thermal Insulation ○ Types of insulating material with examples of each	3	2	
4.3. Construction techniques ○ Roof ○ Exposed walls ○ Windows and floors,	5	3	
5 FIRE SAFETY (STANDARDS AND MECHANISMS)	15	10	CO1,CO2, CO3,CO4
5.1. Introduction ○ Definition: Fire protection, fire prevention ○ High rise building	1	1	
5.2. Concepts: Exit, exit access, exit discharge, exit access corridor, exit discharge, travel distance, refuge exit door ,fire compartment, fire door, fire exit, fire fighting shaft, fire load, fireman's lift, fire resistance, fire resistance rating, means of egress, refuge area,	3	2	
5.3. Fire suppression systems, gas based systems , water based systems, hydrant system, automatic sprinkler system, automatic water spray systems, water mist systems, foam protection system, wet riser	2	1	
5.4. New features: fire fighting to safeguard and assist the fire fighter while discharging his duties.	1	1	
5.5.Important considerations in fire protection of buildings	1	1	
5.6.Fire resisting properties of common building materials	1	1	
5.7.Constructional techniques used for fire resistance of building fire safety devices	1	1	
5.8. Detailing of fire escape	3	1	
5.9.Fire fighting layout	2	1	
Total	75	48	-

6.COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises, practicalsheets, case studies, study modelsand site visits.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	VENTILATION AND AIR CONDITIONING	20	30
2	ACOUSTICS AND SOUND INSULATION	9	15
3	MECHANICAL VERTICAL TRANSPORTATION SYSTEM	3	5
4	THERMAL INSULATION	6	10
5	FIRE SAFETY(STANDARDS AND MECHANISMS)	10	15
	Total	48	75

8.SPECIFICATION TABLE FOR TERM WORK & PRACTICALS MARKS

No	Practical	Marks	Hrs
Unit1.	1 sheet on Natural ventilation design for a G+1 bungalow	6	8
	1 model to study natural ventilation through wind and stack effect	4	
	The students will do a case study of a public building with Central Air conditioning layout -presentation and report	4	
	1 sheet on mechanical ventilation and Air conditioning with AC layout	6	
Unit2	The students will do a case study for an acoustical auditorium and sound insulated room-presentation and report	6	6
	1 sheet on Acoustics and sound insulated room	4	
Unit3	1 case study on lifts –regular and panoramic -presentation and report	2	4
	1 report on 1)escalators 2) cleaning devices	2	
Unit4	The students will do a model study in the sun during different timings; and orientation and record the observations in the form of a report.	2	6
	The students will prepare an sheet on Thermal insulation	4	
Unit5	The students will review newspaper articles about fires occurring and list cause of fire	2	8
	The students will conduct a case study on the fire protection for a public building -presentation and report	4	
	1 sheet on fire safety	4	
	Total	50	32

9.LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1		National building code of India 2016 Volume 1	Bureau of Indian Standards
2		National building code of India 2016 Volume 2	Bureau of Indian Standards
3	Aly S. Dadras N.C.A.R.B.	Mechanical Systems for Architects	McGraw –Hill, Inc.
4	Aly S. Dadras N.C.A.R.B.	Electrical Systems for Architects	McGraw –Hill, Inc.
5	Dr. B. C. Punmia Er. Ashok K. Jain Dr. Arun K. Jain	Building construction	Laxmi Publications (P) Ltd.

(AR504) BASICS OF STRUCTURAL DESIGN

1. COURSE OBJECTIVES: The course is designed to enable the understanding of design philosophies for designing and detailing of RCC structure, foundation details and steel structure. An introduction to Prestressed concrete is included in the course. With knowledge of foundation design and introduction to earthquake resilient structures in this field, the students will be able to supervise construction efficiently.

2. TEACHING AND EXAMINATION SCHEME:

Semester	V				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
		L	T	P		TH	TM	TW	PR/OR	
(AR504) BASICS OF STRUCTURAL DESIGN		3	-	2	5	75	25	25	-	125

3. COURSE OUTCOMES:

On completion of this course the student will be able to:

1. Identify various concepts in RCC Design , prestressed Design and steel structures in building design.
2. Relate the type of structure with the foundation details.
3. Prepare sketches of RCC design and details.
4. Apply concepts of RCC design philosophies and earthquake resistant concept to working drawings.

4. Mapping Course Outcomes with Program Outcomes

Relationship :1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	1	-	1	-	1	1	2
CO2	2	1	2	1	1	-	2
CO3	-	-	2	-	1	1	2
CO4	2	2	2	--	2	-	2

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	1	-
CO2	2	-
CO3	2	-
CO4	2	-

5. DETAILED COURSE CONTENT/ MICRO-LESSON PLAN:

M = Marks Thr = Teaching hours CO = Course Objectives			
UNIT	M	Thr	CO
1.INTRODUCTION TO REINFORCED CEMENT CONCRETE(RCC) STRUCTURE DESIGN	12	8	CO1, CO3
1.1 Design philosophies in R. C. C structures, limit state method versus working stress method	3	2	
1.2 Concept of balanced, under reinforced and over reinforced section	3	1	
1.3 Concept of singly reinforced and doubly reinforced beam section with sketches as per IS code 456	3	2	
1.4 Concept of column design ,one way and two way slab design with detailed reinforcement sketches	3	3	

2. FOUNDATIONS AND DETAILING	16	10	CO2
2.1 Introduction to foundations and bearing capacity of soil, Depth of foundation, need for tensile reinforcement in footings, Concept of design of wall footing	6	4	
2.2 Design procedure and detailing of steel of isolated footings, combined footing, mat or raft foundations (No numerical problems)	6	4	
2.3 Introduction to pile foundations, pile cap, reinforcement	4	2	
3. STEEL STRUCTURES	13	8	CO3, CO1
3.1 Advantages and disadvantages of steel structures.	3	2	
3.2 Rolled steel sections, types of structural steel, simple connections- bolted and welded	4	2	
3.3 Types of column bases, slab base, gusset base, grillage footing	3	2	
3.4 Introduction to steel girders	3	2	
4. PRESTRESSED CONCRETE STRUCTURES	16	10	CO3, CO1
4.1 Introduction to prestressed concrete, Advantages and disadvantages of prestressed concrete	4	2	
4.2 Reinforced concrete versus prestressed concrete	4	3	
4.3 Prestressing systems, steel and concrete for prestressing	4	3	
4.4 Basic concepts of prestressed concrete design	4	2	
5. INTRODUCTION TO EARTHQUAKE RESISTANT STRUCTURES	18	12	CO4
5.1 Earthquake, ground motion, causes of earthquakes, effects of earthquake, seismic zoning in India	4	3	
5.2 Principles of planning overall form of structure with reference to simplicity and symmetry, not too elongated in plan or elevation, stiffness and strength and vertical and horizontal members	4	3	
5.3 Effect of non-structural elements like cladding, in-fill walls and partition walls, soft and weak storey	4	2	
5.4 Earthquake resistant features in masonry structures	3	2	
5.5 Shear wall in concrete structures	3	2	
Total	75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, site visits and reports with reference to structural drawings.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	INTRODUCTION TO REINFORCED CEMENT CONCRETE(RCC) STRUCTURE DESIGN	8	12
2	FOUNDATIONS AND DETAILING	10	16
3	STEEL STRUCTURES	8	13
4	PRESTRESSED CONCRETE STRUCTURES	10	16
5	INTRODUCTION TO EARTHQUAKE RESISTANT STRUCTURES	12	18
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS MARKS

No	Practical	Marks	Hrs
1.	Sketches of details of reinforcement in isolated footing, combined footing, slab, staircase , column and beam column junction	5	4
2	Soil Laboratory visit to observe the soil testing , sketches of foundation detailing	5	8
3	Report on site visit to steel structure construction site.	5	4
4	Sketches on system of prestressing and end block. Site visit report on prestressing	5	8
5	Sketches of earthquake resistant structures – planning of plans and elevation, symmetry, stiffness, shear walls, horizontal and vertical connections	5	8
	Total	25	32

9. LEARNING RESOURCES

S. No.	Author	Title of Books	Publishers
1	Ashok K. Jain,	Reinforced Concrete,	Nem Chand & Bros, Roorkee
2	S.N.Sinha,	Reinforced Concrete Design,	Tata McGraw Hill. Delhi
3	L S Negi,	Design of Steel Structures,	Tata McGraw Hill ,Delhi
4	S. K. Duggal	Design of steel structures	Oxford University Press, delhi
5	S. K. Duggal	Earthquake resistant design of structures	Tata Mac Graw Hill
6	IS 456 -2000& IS-800 -2007, IS 1893, and IS 4326, IS 13827 and IS 13828	IS codes	

(AR511) SITE SUPERVISION & MANAGEMENT

1. COURSE OBJECTIVES: The students would need to inspect site processes and building construction whenever sent by Architect while on Architectural training in Sem VI. Hence the course is designed to enable the students to gain knowledge about various aspects and the processes involved in the site and building management. They would understand the significance of construction management, the various planning processes involved for any project and sequencing of any construction process. Also, they would be able to implement quality control and safety standards at site.

2. TEACHING AND EXAMINATION SCHEME

Semester	V				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)				Theory Marks		Practical Marks		Total Marks
						TH	TM	TW	PR/OR	
(AR511) SITE SUPERVISION & MANAGEMENT		L	T	P	H					
		3	-	2	5	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Define the importance, objectives, functions and types of planning processes; types of various organisations and roles and duties of site personnel.
2. Understand conventional and network methods.
scheduling of resources and developing work break-down structure for any project.
3. Supervise site works and give instructions to labourers. .
4. Report the observations regarding compliance with quality control, procedures specifications and safety during site inspection.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	1	1	1	-	2	1	2
CO2	3	2	2	2	2	2	2
CO3	2	1	2	1	3	3	2
CO4	3	2	3	1	3	3	2

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	2	3
CO2	3	3
CO3	-	3
CO4	-	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Thr	CO		
1 .PROJECT PLANNING	10	6	CO1		
1.1 Importance of Project Planning.	2	1			
1.2 Objectives of Project Planning.	2	1			
1.3 Functions of Project Management.	2	2			
1.4 Aspects/Types of Planning & Production targets.	4	2			
2. METHODS OF PLANNING & SCHEDULING	10	7	CO2		
2.1 Conventional Methods.	3	2			
2.2 Network Methods.	3	2			
2.3 Advantages of network methods over conventional methods.	4	3			
3. RESOURCE PLANNING & STAGES IN CONSTRUCTION	16	10	CO2		
3.1 Scheduling resources.	2	1			

3.2 Selection of Planning methods.	2	1	
3.3 Resources for Construction Industry.	3	2	
3.4 Different stages in planning for project.	3	2	
3.5 Work break-down structure	3	2	
3.6 Site supervision & Instructions to labourers.	3	2	
4. ORGANISATION IN CONSTRUCTION INDUSTRY	15	10	CO3
4.1 Principles of Organisation.	2	1	
4.2 Major Aspects in Organisation.	3	2	
4.3 Types of Organisations.	3	2	
4.4 Important duties and roles of various staff on site.	4	3	
4.5 Knowledge of Temporary Services.	3	2	
5. INSPECTION, QUALITY CONTROL & SAFETY IN CONSTRUCTION	24	15	CO4
5.1 Need for Inspection & Quality.	2	1	
5.2 Principles of Inspection.	2	1	
5.3 Enforcement of Specifications.	2	1	
5.4 Stages of Inspection & Quality Control.	5	3	
5.5 Testing of Structures.	4	3	
5.6 Importance of Safety in construction.	5	3	
5.7 Safety measures for various works.	4	3	
Total	75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and casestudies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	PROJECT PLANNING	6	10
2	METHODS OF PLANNING & SCHEDULING	7	10
3	RESOURCE PLANNING & STAGES IN CONSTRUCTION	10	16
4	ORGANISATION IN CONSTRUCTION INDUSTRY	10	15
5	INSPECTION, QUALITY CONTROL & SAFETY IN CONSTRUCTION	15	24
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS MARKS

No	Practical	Marks	Hrs
1.	Prepare a report on importance of Project Planning. Also list the objectives and functions of Project Planning & Management.	3	2
2.	Prepare a report on conventional and network methods of planning and scheduling with their advantages and/or disadvantages. Also prepare a bar chart for construction of compound wall/security cabin/Store Room of 10 sq.mts.	4	4
3.	Prepare a report by visiting a construction site and study the resource requirement (with images) in construction industry. Explain methods used to store different resources at site and suggest ways to improve the methods for storing of resources.	5	8
4.	Prepare a report on the principles of organisation, different types of organisations and important duties and roles of various site personnel.	5	8
5.	Visit a site and prepare a report on importance of inspection and quality control with reference to the selected site. Explain with images various equipments used in testing of structures. Also explain the importance of safety at site and list different safety equipments (with images) used at construction sites and their explain the importance of each equipment.	8	10
Total		25	32

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Sushil Kumar	Building Construction	Standard Publishers Distributors
2	K. S. Rangwala & P. S. Rangawala	Building Construction	Charotar Publishing House
3	P. S. Gahlot & B. M. Dhir	Construction Planning & Management	Wiley Eastern Limited
4	Bureau of Indian Standards	National Building Code Of India 2016 - Vol 2	Bureau of Indian Standards

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Basil Coukins	Labour Based Construction Programs	World Bank Publication
2	S. C. Rangwala	Construction of Structures and Management of Works	Charotar Book Stall
3	Harpal Singh	Construction Management and Accounts	Tata McGraw-Hill Publishing Company Limited
4	P. T. Ghan	Third Year Civil Engg. Construction Management	Vrinda Publications

(AR512)PROFESSIONAL PRACTICE

1. COURSE OBJECTIVES: As the students will be undergoing their Architectural Training in the following Semester VI; they need to be familiar with the structure & working of an Architect's Office as well as the different aspects of the Professional Practice of an Architect. Also, trainee should be able to handle the different stages involved in the Architectural Practice and field work.

Hence the course is designed to enable the student to understand the Duties, Liabilities & Responsibilities of all Stake holders in the Architectural Practice and gain knowledge of different regulatory authorities. They would also be able to understand the requirements of planning & project management.

2. TEACHING AND EXAMINATION SCHEME

Semester	V									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
(AR 512) PROFESSIONAL PRACTICE		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Define the role and scope of works of all Stake holders in the Architectural Practice.
2. Understand the structure & workings of an Architect's Office and understand his role as an Architectural Assistant.
3. Handle the documentation required to be submitted to the different Statutory Bodies for the purpose of approval
4. Implement Project management skills to co-ordinate and monitor building project.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	1	-	-	-	3	1	1
CO2	3	-	-	-	3	2	2
CO3	3	3	-	-	3	3	3
CO4	2	2	1	1	3	3	3

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	3	3
CO2	3	2
CO3	3	3
CO4	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives	
Unit	M	Thr	CO
1 MEANING OF PROFESSION & PRACTICE	15	9	CO1 CO2
1.1 Introduction: Meaning of Profession, Council of Architecture, Purpose/powers of council of Architecture, Title of architect, Code of Conduct, IIA, Duties of an architect (Ethics) towards Client, COA, Professional Brothers, Society, Calling he has opted for.	5	3	
1.2 Starting the Practice, Understanding the structure of an architect's office, Scope of work between the different positions Scope of work of Architectural Assistant	5	3	
1.3 Office Management: Qualities of a Good manager/Leader , Time & Finance Management. Factors responsible for mismanagement 1.4 Work Ethics	5	3	

2. DUTIES & LIABILITIES IN PROFESSION	15	10	CO1 CO2
2.1 Duties, Responsibilities & Liabilities of Client, Architect, Consultants, Contractors.	5	4	
2.2 Scope of work between Client, Architect, Consultants, and Contractors.	5	3	
2.3 Definition of Arbitration, Arbitrator, Advantages/Purpose of Arbitration	5	3	
3 RULES& REGULATIONS FOR APPROVALS	15	10	CO3 CO4
3.1 Rules& regulations governing each project based on location Zoning: conditions of each zone/special zones(prevalent regulations in Goa)	3	2	
3.2 Requirements of submission File: Documents, drawings, questionnaire, forms, colour codes	2	2	
3.3 Introduction to National Building code	5	3	
3.4 Service Planning regulations – garbage, sanitary, water harvesting, Fire fighting, lifts	5	3	
4 CONTRACTS	15	9	CO4
4.1 Definition of Contract, Importance of contract, Classification of Building Contracts, Characterisation & advantages of each type	4	2	
4.2 Liabilities& responsibilities of architect, clients & Contractor under Contract	4	3	
4.3 Definition of terms; Act of God, Liquidated damages, Unliquidated Damages, Discharge of contract, Completion certificate, Site engineer, Site Supervisor, Sub-contractor	4	3	
4.4. Introduction to RERA: Overview, significance, function and duties of Builder, consumer and broker in Real estate Sector; Role and responsibilities of Engineers, Architects and Chartered Accountants in RERA.	3	1	
5 PROJECT MANAGEMENT	15	10	CO4
5.1 Stages of Project handling: Planning, Approval process, Tendering, site works, Occupancy, Scope of works of each stage.	5	3	
5.2 Scheduling and Monitoring of Construction Project; Introduction of Bar Charts, Advantages of Scheduling, Preparation of site Layouts with Labour equipments& site structures, Supervision-Quality Control – Material testing	5	3	
5.3 Safety & Health Requirements on construction Site	5	3	
	75	48	

6. COURSE DELIVERY:The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	MEANING OF PROFESSION & PRACTICE	9	15
2	DUTIES & LIABILITIES IN PROFESSION	10	15
3	RULES & REGULATIONS FOR APPROVALS	10	15
4	CONTRACTS	9	15
5	PROJECT MANAGEMENT	10	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS MARKS

Unit No	Practical	Marks	Hrs
1.	The student is required to visit an Architect's office to, study the structure of the office and scope and management of works and write a report on the same.	5	6
2.	The student is required to meet with the client, Architect, contractor regarding a project and interview them with respect to their duties and liabilities and prepare a report of the same	5	8
3.	The student will have to prepare a report on the different by-law parameters of a given zone, for a given plot.	5	6
4.	The student will have to get a contract document and note its parameters.	4	6
	The student will have to prepare a report on the basics of RERA	1	
5.	The student will have to prepare a PERT chart for a given project.	5	6
	Total	25	32

9. LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Dr. Roshan Namavati	Professional Practice	Lakhani Book Depot
2	Prof. Madhav Deobhakta	Architectural practice in India	Super book house
3	Robert J. Piper	Opportunities in Architecture	VGM Career Horizons
4		National Building Code of India 2016 Volume 1&2	Bureau of Indian Standards
5		The Goa Regulation of Land Development and Building Construction (prevalent regulations)	Government Printing press

(AR513) BUILDING SERVICES MANAGEMENT

1.COURSE OBJECTIVES: The students will need to have the knowledge about the practical aspects of installation, supervision and management of building services like water supply, sewer systems and electrical installation on the building site.

Hence the course is designed to enable the students to study the different components, arrangements, distribution networks, installation techniques with precautionary measures and planning codes for building services for a Multi-storeyed building. They would also gain knowledge of the innovative emerging sustainable approaches of the same.

2. TEACHING AND EXAMINATION SCHEME

Semester	V				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
		L	T	P		TH	TM	TW	PR/OR	
(AR513) BUILDING SERVICES MANAGEMENT		3	-	2	5	75	25	25	25	150

3.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Describe the parameters of water supply, sewer and electrical systems and installations
2. Understand the requirements for water supply, sewer and electrical systems layout and components with emerging sustainable technologies & practices for a Multi-storeyed building.
3. Prepare the necessary drawings of services like plumbing, Sanitation, electrical from site level to detail level for multi-storeyed building.
4. Supervise installation of services like plumbing, Sanitation, electrical from site level to detail level for multi-storeyed building complex considering safety precautions.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	-	-	-	1	1	1
CO2	2	2	1	1	3	2	2
CO3	1	-	2	1	2	3	3
CO4	1	2	3	-	3	3	2

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	1	2
CO2	2	2
CO3	3	3
CO4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1. WATER SUPPLY SYSTEMS			20	12	CO1, 2,3,4
1.1 Water requirement for different usages and Storage requirements			3	2	
1.2 Water distribution systems in multi storied building			7	4	
1.3 Installation of water supply components : pipes-wall, concealed			7	4	
1.4 Hot water supply			3	2	

2. SEWER SYSTEMS	18	10	CO1, 2,3,4
2.1 Sewage system layout : connecting sewer systems and treatment in a multi storied building	5	3	
2.2 Different components of Drainage systems	3	1	
2.3 Types of Plumbing and drainage systems	5	3	
2.4 Installations of different components of Drainage systems	5	3	
3. ELECTRICAL SYSTEMS	12	8	CO1, 2,3,4
3.1 Introduction to electrical systems a) Terminologies - Voltage , current, power & study the general rules for lighting	2	2	
3.2 Electrical Distribution System and its components in a multi storied building a) Power Requirement, Incoming Power source voltage, Transformers, Meter, wiring, Power sub- circuits, Distribution circuits, Placement of meter, main switches etc. b) Necessity of earthing and its installation in building	6	4	
3.3 Electrical layout Design : Compliance to local building codes	4	2	
4. ELECTRICAL INSTALLATIONS ON SITE	12	8	CO1, 2,3,4
4.1 Basics of Electrical installations work a) Laying of underground supply lines, laying conduits in concrete slab and beam reinforcement, fixing of fan hooks, conduit box position in slab reinforcement for main supply to consumers units b) Installation of concealed wiring, cleat wiring in wall along with switchboard position	10	6	
4.2 Safety measures and precautions to be observed on site	2	2	
5. EMERGING SUSTAINABLE TECHNOLOGIES FOR ENERGY CONSERVATION OF BUILDINGS	13	10	CO2
5.1 Water management: rain water harvesting, recycling grey water.	5	4	
5.2 Sewage and waste management: biogas	4	3	
5.3 Electrical systems: Solar systems, rating systems	4	3	
Total	75	48	-

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and casestudies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	WATER SUPPLY SYSTEMS	16	20
2	SEWER SYSTEMS	14	18
3	ELECTRICAL SYSTEMS	10	12
4	ELECTRICAL INSTALLATIONS ON SITE	10	12
5	EMERGING SUSTAINABLE TECHNOLOGIES FOR ENERGY CONSERVATION OF BUILDINGS	14	13
	Total	64	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS MARKS

No	Practical	Marks	Hrs
1.	A3 size sheets on water supply systems for a multi –storied building project.	7	8
2.	A3 size sheets on sewer systems for a multi –storied building project.	6	8
3.	A3 size sheets on electrical systems for a multi –storied building project.	4	6
4.	A4 or A3 size report of site visit for electrical installations.	4	5
5.	A3 size report on Case study on emerging sustainable technologies for energy conservation of buildings.	4	5
	Total	25	32

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	S.M. Patil	Building services	Standard pub. Dist. Delhi
2	S.C. Rangawala	Water Supply and Sanitary Engineering	Charotar Publishing House, Anand, Gujarat
3	Anwani	Basic wireman	Dhanpat Rai and Co.
4	Aly S. Dadras, N.C.A.R.B	Electrical Systems for Architects	McGraw-Hill, Inc.
5		Environmental Engineering	Technical Teacher's Training Institute (Madras)
6	Bureau of Indian Standards	National building code of India 2016 Volume 2	
7		Griha Manual- Volume 1	Ministry of New and renewable energy, Government of India and Teri
8		Indian Green Building council(IGBC) Manual	

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Santosh Kumar Garg	Water Supply Engineering	Khanna Publishers, New Delhi
2	Santosh Kumar Garg	Sewage Treatment and sewerage	Khanna Publishers, New Delhi
3	G.S. Birdi	Water Supply and Sanitary Engineering	Dhanpat Rai & Sons, New Delhi

(AR514) ADVANCED MATHEMATICS – ARCH.

1. COURSE OBJECTIVES : The students need to develop a mathematical approach for solving engineering and technological problems. Hence the course will enable the students to acquire knowledge of Mathematical terms, concepts, principles and different methods. They will develop the ability to apply mathematical methods to solve technical problems, to execute management, plan with precision. They will also acquire sufficient mathematical techniques necessary for daily and practical problems.

2. TEACHING AND EXAMINATION SCHEME

Semester	V				Total Hours	Examination Scheme				
Course code & course title		Periods/Week (in hours)				Theory Marks		Practical Marks		Total Marks
						TH	TM	TW	PR/OR	
(AR514) ADVANCED MATHEMATICS – ARCH.		L	T	P	H	TH	TM	TW	PR/OR	150
		3	-	2	5	75	25	25	25	

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Recall formulae of mathematics.
2. Apply the formulae of mathematics to solve mathematical problems.
3. Use differential equation to solve Engineering problems.
4. Develop their lateral thinking abilities in solving mathematical problems

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	2	-	-	-	-	1
CO2	3	2	-	-	-	-	1
CO3	3	2	-	-	-	-	1
CO4	3	2	-	-	-	-	1

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	-	1
CO2	-	1
CO3	-	1
CO4	-	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Thr	CO		
1 DERIVATIVES	18	12	CO1, CO2, CO4		
1.1 Concepts of Limits 1.2 Algebraic properties of derivative 1.3 Derivatives of algebraic, trigonometric, exponential, logarithmic functions 1.4 Derivatives of sum, difference 1.5 Derivative of product of functions 1.6 Derivative of u/v 1.7 Derivative of composite function 1.8 Derivative of parametric function 1.9 Derivative of implicit function					
2 .INTEGRATION	15	12	CO1, CO2, CO4		
2.1 Definition & Standard Formulae 2.2 algebraic properties of Integration for sum, difference and scalar multiplication, 2.3 integration of algebraic, trigonometric, inverse trigonometric, exponential, logarithmic functions					

2.4 Integration by substitution 2.5 Integration by parts			
3 .DEFINITE INTEGRALS & APPLICATION	12	8	CO1, CO2, CO4
3.1 Definition of definite integral and Properties of definite integral 3.2 Applications: Area under the curves & lines and area between the curves and Volumes			
4. DIFFERENTIAL EQUATIONS	15	8	CO1, CO3, CO4
4.1 Definition, order and degree of differential equations, Ordinary and partial differential equations 4.1.1 Solution of differential equation (variable separable method), general solution, particular solution 4.2 Applications to linear motion (first order) 4.3 Solution of Second order differential equations of type $d^2y/dx^2 = f(x)$			
5. VECTORS	15	8	CO1, CO2, CO4
5.1 Definition of scalars & vectors, equality of vectors, 5.2 Addition & subtraction of vectors, triangle, parallelogram laws for addition, position vector, dot product & cross product and their properties and applications, relation between dot and cross product			
Total	75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions and exercises.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	DERIVATIVES	12	18
2	INTEGRATION	12	15
3	DEFINITE INTEGRALS & APPLICATION	8	12
4	DIFFERENTIAL EQUATIONS	8	15
5	VECTORS	8	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS MARKS

No	Practical	Marks
1.	Mat lab	25
	Total	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Deshpande S.P	Mathematics for Polytechnics	GrihaPrakasham, Pune 1996 or latest
2	Grewal B.S	Engineering Mathematics	Khanna Pub., New Delhi 1995 or latest

(CC501) ENTREPRENEURSHIP DEVELOPMENT

- 1. COURSE OBJECTIVES:** Today Entrepreneurship is given importance by the government to bring the youth of our country to overcome the problem of unemployment and bring them in the main stream of global business to strengthen Indian economy by Make in India philosophy. Government has announced various financial schemes for young youth and women to support them for setting up an enterprise. To fulfill this, youth are to be prepared for setting an enterprise. The students undergoing this course will be develop entrepreneurial traits and confidence within themselves and choose entrepreneurship as a career to brighten their future.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
CC501 Entrepreneurship Development	L	T	P	C	-	-	PR/OR	TW	25
	-	-	2	2	-	-	-	25	

Minimum passing % Practical 40%

3.COURSE OUTCOMES:

CC501CO1: List the terms associated with Entrepreneurship Development.

CC501CO2: Explain the terminologies and procedures involved in Entrepreneurship Development

CC501CO3: Identify legal implications for Entrepreneurs. CC501CO4: Develop the project report for new enterprise.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CO1	1	0	0	0	2	3	2	1	1
CO2	1	0	0	0	1	3	2	1	1
CO3	0	1	2	0	0	0	2	1	1
CO4	3	2	2	0	2	0	2	1	1

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS

M=Marks	Phr= Practical hours	CO – Course Outcomes			
Unit			M	Phr	CO
1 Entrepreneurship Development			3	4	CO1, CO2, CO3, CO4
1.1 Introduction to Entrepreneurship Development (EDP): Need					
1.2 Entrepreneur definition, Types of Entrepreneur, Characteristics of entrepreneur and entrepreneurship					
1.3 Enterprises: Micro, Small and Medium Enterprises (MSME), Service industry, Manufacturing Industry, Franchises and Start up.					
1.4 Organisations: Solo proprietorship, Partnership, Public, Co-operative Society.					
2. Identification of business opportunity			5	6	CO1, CO2, CO3, CO4
2.1 business ideas- Exploring business ideas in terms of marketability, technical feasibility, financing and authorities					
2.2 Business terms: - Clients, vendors market description, demand, supply, banking, & non-banking, financing companies, Loans of various types, GST, peers Promoters, Lenders, Consortium.					
2.3 Government Departments: - IDC, EDC, Civic Body, Pollution Control department.					
3. Market Research			3	4	CO1, CO2, CO3, CO4
3.1 Data Collection: - Data collection of Business idea such as Number of players, Total demand, Total supply,					
3.2 Analysis of Data: - Analysis of data and projection of data with respect to various factor (such as GDP, Climate etc through case studies).					
3.3 Questionnaire: - Preparing a questionnaire for business idea to assess business opportunity.					
4. Legal Aspect			8	10	CO1, CO2, CO3, CO4
1.1 Legal Financial Term: - Know the various terms such as Resources, Assets, Liabilities, Advances, Depreciations, Investments, Fixed Capital, Working Capital (cash credit), Employee Cost, Miscellaneous Expense, Other Income, Profit & Loss Statement, Cash Flow Analysis, and Balance Sheet.					
1.2 Legal Aspects: - Procedure for Registration with various government agencies, GST, PAN, Slab of Income Tax. Difference in use of electricity, water & LPG for domestic purpose and industrial applications.					
1.3 Business Analyses: -					

1) Swot Analysis 2) Break – Even Analysis			
5. Project Report	6	8	CO1, CO2, CO3, CO4
5.1 Need for project report, Importance of Project report, Scope of project report: Economic aspects, Technical aspects, Financial aspects, Managerial aspects, Production aspects. List the contents of a project report. Proforma of a project report which includes: -Introduction, Schemes, Profitability and Projections, Infrastructure, Break Even Point, Names and Addresses of suppliers, remarks.			
5.2 Project Profile: - Project appraisal criteria: - Technical feasibility, Financial feasibility, Economic viability, Commercial viability, Managerial competency, Political and Labour considerations			
5.3 Scope of Business: - Further scope with Capital infusion, Exit plan Analysis.			
Total	25	32	

6. COURSE DELIVERY:

Videos / Lectures/ Practicals /Expert lectures / Industry visits

7. SPECIFICATION TABLE FOR PRACTICALS

Unit No.	Topic	Teaching Hours/ Semester	MARKS
1	Entrepreneurship Development	4	3
2	Identification of business opportunity	6	5
3	Market Research	4	3
4	Legal Aspect	10	8
5	Project Report	8	6
TOTAL		32	25

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICAL MARKS

No	Classroom Assignments	Marks
1.	Prepare a Case Study on leading enterprise	3
2.	Prepare a Case Study on small scale unit	3
3.	Prepare a report on various government schemes for start up.	4
4.	Prepare SWOT analysis for a new business idea.	5
5.	Prepare Project Report for a new business idea.	10

9. LEARNING RESOURCES

S.No.	Author	Title of Books	Publisher
1.	Sharad jawadekar, shobha dodlani,	Business entrepreneurship	Suvichar prakashan mandal pune,
2.	S.S. Khanna	Entrepreneurship development	S. Chand & Co. Ltd, New Delhi,
3.	Vasant Desai	Management of small- Scale Industry in India	Himalaya Publishing House
4.	DilipSarwate	Entrepreneurial development Concepts and practices	Everest Publication House, Pune
5.	CB Gupta and P Srinivasan	Entrepreneurship Development	S. Chand and Sons, New Delhi

(AC101) ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

1. **COURSE OBJECTIVES:** This course aims at imparting basic principles of thought process, reasoning and inferencing by human being. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature. Holistic life style of Yogis, science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and social disruptions. The course thus focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world- view, basic principles of Yoga and holistic health care system.

2. TEACHING AND EXAMINATION SCHEME:

SEMESTER V									
	Periods/ Week (In Hours)			Total Credit	Examination Scheme				
Course Code & Course Title					Theory Marks	Practical Marks		Total Marks	
(AC101) ESSENCE OF INDIAN KNOWLEDGE AND TRADITION	L	T	P	H	TH	TM	TH	PR/OR	TM
	2	--	--	2	--	--	--	--	--

2. DETAILED COURSE CONTENTS/:

UNIT	M	T hr	C o
1 .BASIC STRUCTURE OF INDIAN KNOWLEDGE	--		--
(i) वेद (ii) उपवेद (आयुर्वेद धनुर्वेद गन्धर्ववेद अथापत्यवेद) (iii) वेदांग (शिक्षा कल्प निरुक्त व्याकरण ज्योतिष छंद) iv) उपांग (धर्मशास्त्र मिमांसा पुराण तर्कशास्त्र)			
2. MODERN SCIENCE AND INDIAN KNOWLEDGE SYSTEM			
3 .YOGA AND HOLISTIC HEALTH CARE			
4 .CASE STUDIES			
TOTAL		32	

3. SUGGESTED LEARNING RESOURCES

Sr. No	TITLE OF BOOK	AUTHOR	PUBLICATION
1	Cultural Heritage of India Course Material.	V. Sivaramakrishna	Bharatiya Vidya Bhavan, Mumbai, 5th Edition
2	Modern Physics and Vedant	Swami Jitatmanand	Bharatiya Vidya
3	The wave of Life	Fritz of Capra	
4	. Tao of physics	Fritz of Capra	
5	Takasangraha of Annam Bhatta, International	V N Jha	Chinmay Foundation, Velliarnad Amakulam
6	Science of Consciousness Psychotherapy and Yoga Practices	. R N Jha	Vidyanidhi Prakasham, Delhi,

DIPLOMA IN ARCHITECTURAL ASSISTANTSHIP CURRICULUM STRUCTURE FOR SEM VI											
Semester	Code	Subjects	L	T	P	H	TH	TM	PR	TW	TOT
SIXTH	TR601	Architectural Training	16 weeks						100	100	Grade
L- Lecturers T – Tutorial P – Practical C-Credits TH – Theory Marks TM – Test Marks PR – Practical Marks TW- Term Work Marks											

(TR601) ARCHITECTURAL TRAINING

1. COURSE OBJECTIVES: The students will be able to gain professional experience by working in an Architect's office and on building site. They would be able to apply knowledge and skills acquired from Semester I to Semester V courses of the Programme of Architectural Engineering into practice. The trainee student has the responsibility as well as the opportunity to prepare themselves for the profession.

2. TEACHING AND EXAMINATION SCHEME

Semester	VI									
Course code & course title		Periods/Week (in hours)			Total Credits	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
(TR601) ARCHITECTURAL TRAINING		L	T	P	C	TH	TM	TW	PR/OR	
		16 WEEKS			-	-	-	100	100	Grade

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Identify his/her role in the architectural office as a trainee.
2. Understand procedures, methodologies and professional obligations in office and on site.
3. Work in an Architectural office and building site.
4. Develop a professional competency in the architectural profession.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	1	-	-	3	1	3
CO2	3	2	1	-	3	2	3
CO3	3	2	3	3	3	3	3
CO4	3	1	3	3	3	2	3

Relationship : Low-1 Medium-2 High-3

PSO1: Ability to apply the knowledge of Architectural theory, construction , services, standards and procedures; and assist in sustainable design development; and skills in preparation of presentation, technical and construction drawings and documents using modern software within specified time and in a professional manner.

PSO2: Ability to supervise building construction procedures and services; prepare estimates; and assist in site and project management; with regards to health , safety , sustainability and social wellbeing; through effective understanding of drawings and documents and communication with stakeholders for systematic execution.

	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Trainin g weeks	CO
1. ORIENTATION PROGRAMME					
1.1 Orientation programme will be conducted in the institute to orient the students for undergoing training in Architectural offices. 1.2 Purpose of training 1.3 Office structure 1.4 Scope of work as a trainee 1.5 Documents to be taken to the office: attendance sheet, daily diary, letter from institute. 1.6 Professional work ethics- punctuality, discipline, responsibility, communication, teamwork <i>Note:Architectural offices to be approved by the Department of Architectural Engineering before the students are placed.</i>			Marking as per Specification Table	1week	CO1 , CO2
4. UNDERSTAND OFFICE STRUCTURE					15

Directorate of Technical Education, Goa State

4.1. Office structure & working of an Architect's Office		weeks	
4.2. Scope of works and the Duties, Liabilities & Responsibilities of all employees in the office			
4.3. Rules and regulations: office, building regulations			
4.4. Project Management- stages and aspects involved			
4.5. Soft skills required: communication, discipline , punctuality, team- worker, adaptability, etc.			

Directorate of Technical Education, Goa State

3. OFFICE WORK		
The student is expected to be exposed to the following activities in office (<i>but not limited to</i>):		
1. Sketch designs 2. Presentation drawing 3. Development of Designs 4. Preparation of working drawing, 5. Preparation of submission drawing and file as per by-laws 6. Building detail drawings 7. Preparation of service Layouts 8. Preparation of estimates , 9. Computer applications in design and drafting 10. Filing drawings/ documents. 11. Discussions with: - o Clients - o Structural Consultants - o Services Consultants		C02 , C03 , C04
4 SITE WORK		
The student is expected to be exposed to the following activities on site(<i>but not limited to</i>):		
1. Measurement of site/ building/ interior 2. Supervision of construction activity 3. Documentation of site activities 4. Quantity survey, Bill checking		C02 , C03 , C04
5 TRAINING REPORT		
5.1 Portfolio of drawings		
5.2. Written reports: Review of Professional competency gained during training.		
5.3. Photographs, models, etc.		C04
Total	16 Weeks	

6. COURSE DELIVERY:

The Course will be delivered through 1week orientation, architectural training, progressivefeedback, report writing and viva.

7. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	TERM WORK	Marks
1.	Daily Diary : i. The student will maintain authorized Daily diary containing a day- to - day record of - work done for each day for the period of training in office or on site. ii. The diary will have to be countersigned by the Architect at the end of each week and will be presented to the Architect, inspecting faculty and during viva whenever asked.	50
2.	Progressive assessment: i. The student will be assessed periodically on progress. ii. The Architect should do this assessment, in consultation with the inspecting faculty member from the institution. iii. The evaluation is based on the performance of the student during the relevant period. Different factors such as quality and quantity of work accomplished, knowledge, creativity, integrity, leadership, team-worker, communication, personal development, etc. will be the basis of evaluation. iv. Minimum 3 assessments.	50
	PRACTICAL	
1.	Training Report: shall include the copies of various drawings done by the student. i. Portfolio of work at A3 size; duly attested by the Architect. <i>(graphical legibility of work to be mandatory)</i> ii. Written report of the learning acquired during the training period. iii. Other works: eg. Site reports: with photographs, building model, etc. iv. At the end of the training period, a student will have to produce a certificate of experience stating satisfactory performance from the concerned office. <i>(On Architect's letterhead and signed)</i>	50
2.	Report Assessment & Viva: i. The external examiner would assess the Training report. Assessment of Training report based on knowledge, Presentation, Quality of contents and Drawings ii. The student will have to give a Viva-voce .	50
		200

7. LEARNING RESOURCES

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Dr. Roshan Namavati	Professional Practice	Lakhani Book Depot
2	Prof. Madhav Deobhakta	Architectural practice in India	Super book house
3	Robert J. Piper	Opportunities in Architecture	VGM Career Horizons
4		National Building Code of India 2016 Volume 1	Bureau of Indian Standards
5		National Building Code of India 2016 Volume 2	Bureau of Indian Standards
6		The Goa Regulation of Land Development and Building Construction (latest prevalent regulations)	Government Printing press