



**RAMAIAH**  
Institute of Technology

# **CURRICULUM**

**Outcome Based Education**

**For the Academic Year 2023 - 2024**

**SCHOOL OF ARCHITECTURE**

**V & VI Semester B.ARCH**

**RAMAIAH INSTITUTE OF TECHNOLOGY**

(Autonomous Institute, Affiliated to VTU)

Bangalore – 560054.

## About the Institute:

Dr. M. S. Ramaiah a philanthropist, founded ‘Gokula Education Foundation’ in 1962 with an objective of serving the society. M S Ramaiah Institute of Technology (MSRIT) was established under the aegis of this foundation in the same year, creating a landmark in technical education in India. MSRIT offers 17 UG programs and 11 PG programs. All these programs are approved by AICTE. All eligible UG and PG programs are accredited by National Board of Accreditation (NBA). The institute is accredited with ‘A+’ grade by NAAC in March 2021 for 5 years. University Grants Commission (UGC) & Visvesvaraya Technological University (VTU) have conferred Autonomous Status to MSRIT for both UG and PG Programs since 2007. The institute has also been conferred autonomous status for Ph.D. program since 2021. The institute is a participant to the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. The institute has 380 competent faculty out of which 67% are doctorates. Some of the distinguished features of MSRIT are: State of the art laboratories, individual computing facility for all faculty members, all research departments active with sponsored funded projects and more than 300 scholars pursuing Ph.D. To promote research culture, the institute has established Centre of Excellence for Imaging Technologies, Centre for Advanced Materials Technology, Centre for Antennas and Radio Frequency systems (CARFS), Center for Cyber Physical Systems, Schneider Centre of Excellence & Centre for Bio and Energy Materials Innovation. **Ramaiah Institute of Technology has obtained “Scimago Institutions Rankings” All India Rank 107 & world ranking 600 for the year 2022.**

The Entrepreneurship Development Cell (EDC) and Section 8 company “Ramaiah Evolute” have been set up on campus to incubate startups. **M S Ramaiah Institute of Technology is recognized by Atal Ranking of Institutions on Innovation Achievements (ARIIA), MoE, Govt. of India.** MSRIT has a strong Placement and Training department with a committed team, a good Mentoring/Proctorial system, a fully equipped Sports department, large air-conditioned library with good collection of book volumes and subscription to International and National Journals. The Digital Library subscribes to online e-journals from Elsevier Science Direct, IEEE, Taylor & Francis, Springer Link, etc. The Institute is a member of DELNET, CMTI and VTU E-Library Consortium. The Institute has a modern auditorium, recording studio, and several hi-tech conference halls with video conferencing facilities. The institute has excellent hostel facilities for boys and girls. MSRIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association.

**As per the National Institutional Ranking Framework (NIRF), MoE, Government of India, Ramaiah Institute of Technology has achieved 78<sup>th</sup> rank among 1314 top Engineering Institutions & 23<sup>rd</sup> Rank among 105 School of Architecture in India for the year 2023.**

## **SCHOOL OF ARCHITECTURE**

Ramaiah Institute of Technology (RIT), Bangalore, is a leading institution offering undergraduate, postgraduate and research programs in the areas of engineering, management and architecture. The institute was established in the year 1962, under the aegis of Gokula Education Foundation. Its mission is to deliver global quality technical education by nurturing a conducive learning environment for a better tomorrow through continuous improvement and customization.

The School of Architecture, RIT Bangalore, was established in the year 1992. Since its establishment, the School has played a vital role in providing quality education. The Council of Architecture (COA) and All India Council for Technical Education (AICTE) have recognized this program.

The mission of the school is to uphold the RIT mission and to thus provide quality education to the students and mould them to be excellent architects with adequate design and management skills and noble human qualities.

Full time faculty members having postgraduate qualifications from prestigious institutions in India and abroad are teaching at The School of Architecture. Experienced and well-respected practicing architects are invited to provide their experiences as visiting faculty. New milestones are continually being set and achieved. The synergy of the progressive management, committed faculty and students are ensuring excellent academic results year after year. This is reflected in the high number of University ranks that are secured by the students of the School.

The School of Architecture is now autonomous (affiliated to VTU) providing scope for further improvement. The focus has been towards fostering novel concepts and solutions in Architectural Design. The student's response is very encouraging, and the school recognizes and appreciates such good students by awarding them. After graduation, many students have pursued higher studies in various universities in the country and abroad. There is a great demand for the school graduates in the industry and the School is developing initiatives towards co-branding of the industry and the School. Many students have started their own enterprise and architectural practices as well.

All this has been possible as a result of the efforts of the impeccable faculty of the School. The faculty is committed to the welfare and success of the students. The teachers of the school are also engaged in enhancing their knowledge and skills and many are engaged in research activities as well. The School has experts in specialized disciplines like Habitat Design, Product Design, Urban Design, Urban Planning, Landscape Architecture, and Interior Design. The faculty also actively participates in national and international conferences and publishes and presents papers.

The School as part of a consultancy had started off with the maiden project to redevelop the RIT engineering college campus and is now involved in various campus designs.

## **VISION OF THE INSTITUTE**

To be an Institution of International Eminence, renowned for imparting quality technical education, cutting edge research and innovation to meet global socio-economic needs.

## **MISSION OF THE INSTITUTE**

MSRIT shall meet the global socio-economic needs through -

1. Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization.
2. Establishing research clusters in emerging areas in collaboration with globally reputed organizations.
3. Establishing innovative skills development, techno-entrepreneurial activities and consultancy for socio-economic needs.

## **QUALITY POLICY**

We at MS Ramaiah Institute of Technology strive to deliver comprehensive, continually enhanced, global quality technical and management education through an established Quality Management System complemented by the synergistic interaction of the stake holders concerned.

## **VISION OF THE DEPARTMENT**

To achieve and propagate high standards of excellence in architectural education.

## **MISSION OF THE DEPARTMENT**

- The School's commitment is to prepare people to make a difference;
- To create an environment that shall foster the growth of intellectually capable, innovative and entrepreneurial professionals, who shall contribute to the growth of the society by adopting core values of learning, exploration, rationality and enterprise; and
- To contribute effectively by developing a sustainable technical education system to meet the changing technological needs incorporating relevant social concerns and to build an environment to create and propagate innovative designs and technologies.

## **PROGRAM EDUCATIONAL OBJECTIVES (PEOs):**

**PEO 1:** Use the knowledge and skills of Architecture to analyze the real-life problems and interpret the results.

**PEO 2:** Effectively design, implement, improve and manage the integrated socio-technical systems.

**PEO 3:** Build and lead cross-functional teams, upholding the professional responsibilities and ethical values.

**PEO 4:** Engage in continuing education and life-long learning to be competitive and enterprising.

## **PROGRAM OUTCOMES (POs):**

**PO1: Architectural knowledge:** Apply the knowledge of mathematics, science, architectural fundamentals, and an architectural specialization to the solution of complex architectural problems.

**PO2: Problem analysis:** Identify, formulate, review research literature, and analyse complex architectural problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3: Design/development of solutions:** Design solutions for complex architectural problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern architectural and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6: The architect and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional architectural practice.

**PO7: Environment and sustainability:** Understand the impact of the professional architectural solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the architectural practice.

**PO9: Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10: Communication:** Communicate effectively on complex architectural activities with the architectural community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of architectural and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12: Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## **PROGRAM SPECIFIC OUTCOMES (PSOs):**

**PSO1:** Apply knowledge and skills of art and sciences based on function, form, materials, information, facilities, technology and analysis to Design and develop sustainable Architectural Projects.

**PSO2:** Ideate, formulate and solve industrial requirements and problems with a thorough knowledge of contemporary issues in industrial and service sectors and understand the impact of architectural design solutions in a global and societal context.

**PSO3:** Understand and respect professional and ethical responsibility and implement the concepts of project and construction management with the cutting edge technology.

## **BOARD OF STUDIES FOR THE TERM 2023 - 2024**

1	Dr. Pushpa Devanathan	Chairperson
2	Dr. Deepika Shetty	VTU Nominee
3	Ar. Vidyadhar S. Wodeyar	External Industry Expert
4	Ar. Prasad G	External Industry Expert
5	Dr. Rama RS	Academician
6	Dr. Chidambara Swamy	Academician
7	Ar. Subbiah T S	Alumni
8	Prof. Vishwas Hittalmani	Member
9	Prof. Dr. Rajshekhar Rao	Member
10	Dr. Rashmi Niranjana	Member
11	Ar. (Dr.) Meghana K Raj	Member
12	Er. (Dr.) Vijayanand M	Member



# SCHOOL OF ARCHITECTURE

## TEACHING FACULTY

Sl No	Name	Qualification	Designation
1	Dr. Pushpa Devanathan	M.Arch (Habitat Design) P.G.D.I., Ph.D	Professor & HOD
2	Ar. Vishwas Hittalmani	M Des (Industrial Design)	Professor
3	Dr. Rajshekhar Rao	M Arch (Landscape Architecture), PhD	Professor
4	Dr. Jotirmay Chari	M Arch, PhD	Professor
5	Ar. Prasad G	M Arch (Landscape Architecture)	Professor (Tenure)
6	Dr. Rashmi Niranjana	MFA (Fine Arts), PhD	Associate Professor
7	Dr. Monalisa	M Arch, PhD	Associate Professor
8	Ar. Surekha R	M Arch (Landscape Architecture) (PhD)	Associate Professor
9	Ar. Lavanya Vikram	M Arch (Landscape Architecture) (PhD)	Associate Professor
10	Ar. Sudha Kumari	M Arch (Habitat Design) (PhD)	Associate Professor
11	Ar. Meghana K Raj	M Arch (Landscape Architecture) (PhD)	Associate Professor
12	Ar. Tejaswini H	M Arch (Landscape Architecture) (PhD)	Associate Professor
13	Ar. Mallika P V	M Arch (Landscape Architecture)	Associate Professor (Tenure)
14	Ar. Sudhir Chougule	M Arch (Landscape Architecture)	Associate Professor (Tenure)
15	Ar. Nikhil V Wodeyar	P G Dip (Urban Design)	Associate Professor (Tenure)
16	Er. Vijayanand M	M Tech (PhD)	Assistant Professor
17	Er. Aruna Gopal	B E (MSc)	System Analyst
18	Ar. Kriti Bhalla	B Arch	Assistant Professor
19	Ar. Divya Susanna Ebin	M Arch (Urban Design) (PhD)	Assistant Professor
20	Ar. Ranjitha Govindaraj	M Arch (Landscape Architecture)	Assistant Professor
21	Ar. Theju Gowda	M Sc (Architecture)	Assistant Professor
22	Ar. Akshata Shagoti	M Arch (Architectural Design)	Assistant Professor

23	Ar. Amala Anna Jacob	M Arch (Urban Design)	Assistant Professor
24	Ar. Meghana M	M A (World Heritage Studies)	Assistant Professor
25	Ar. Megha Ann Jose	MIAD (Interior Architecture & Design)	Assistant Professor
26	Ar. Pooja M Naik	M Arch (Urban Planning & Mgmt.)	Assistant Professor
27	Ar. Tanvi Katre	M Plan (Environmental Planning)	Assistant Professor
28	Ar. Sreesha S Bhat	M Arch (Urban Design)	Assistant Professor
29	Ar. Harshita D	M Arch (Urban Design)	Assistant Professor
30	Ar. Joyce Sequeira	M Plan (Urban Planning)	Assistant Professor
31	Ar. Shwetha P E	M Arch (Urban Design)	Assistant Professor
32	Ar. Pinki Bose	M Arch (Urban Design)	Assistant Professor
33	Ar. Ashwini Mani	M Arch (Urban Design)	Assistant Professor (Tenure)
34	Ar. Sruti R	M Arch (Urban Design)	Assistant Professor
35	Ar Aparna M P	M Arch ( Urban Design)	Assistant Professor
36	Ar Spoorthi C	M Arch ( Urban Design)	Assistant Professor
37	Ar Babitha Mohammed	M Arch ( Energy efficient & sustainable Arch)	Assistant Professor

#### ADMINISTRATIVE STAFF

1	Mr. Nagesh B L	Dip. in Mech Engg.	Instructor
2	Ms. Swathi P	B. Com	SDA

#### SUPPORT STAFF

1	Mr. Ramachandra Chari	Attender
2	Mrs. Parvathi	Attender

## **BREAKDOWN OF CREDITS FOR B. ARCH DEGREE CURRICULUM (Semester I to X)**

**BATCH 2021 - 2026**

(as per Council of Architecture)

<b>SEMESTER</b>	<b>HUMANITIES &amp; SOCIAL SCIENCES (HSS)</b>	<b>ARTS &amp; SCIENCE (AS)</b>	<b>BASIC ARCHITECTURE &amp; ENGINEERING (BAE)</b>	<b>PROFESSIONAL CORE SUBJECTS (PCS)</b>	<b>ELECTIVES</b>	<b>PROJECT/ INTERNSHIP</b>	<b>TOTAL CREDITS</b>
I	1	7	7	11	-	-	26
II	-	8	7	11	-	-	26
III	-	6	8	11	-	1	26
IV	1	3	11	11	-	-	26
V	2	6	6	11	-	1	26
VI	2	-	13	11	-	-	26
VII	3	-	9	11	3	-	26
VIII	2	-	6	15	3	-	26
IX	-	-	-	-	-	26	26
X	-	-	-	5	3	18	26
<b>Total</b>	<b>11</b>	<b>30</b>	<b>67</b>	<b>97</b>	<b>9</b>	<b>46</b>	<b>260</b>

**SCHEME OF TEACHING & EXAMINATION - V SEMESTER B. ARCH**  
**ACADEMIC YEAR 2023 - 2024**

2021 Batch			Teaching scheme per week					Examination scheme		
Sl. No	Code	Subject	Lecture / Studio	Tutorial	Practical (Study Tour/ Case Study)	Total	Contact hours	Exam	CIE Marks	SEE Marks
1	AR 501	Architectural Design IV	6	0	1	7	8	SEE (viva voce)	50	50
2	AR 502	Building Materials & Construction Technology V	3	0	1	4	5	SEE (viva voce)	50	50
3	AR 503	Contemporary Architecture	3	0	0	3	3	SEE	50	50
4	AR 504	Sociology & Economics	1	0	1	2	3	SEE	50	50
5	AR 505	Architectural Structures V	3	0	0	3	3	SEE	50	50
6	AR 506	Building Services III	3	0	0	3	3	SEE	50	50
7	AR 507	Landscape Design	2	0	1	3	4	SEE	50	50
8	AR 508	Study Tour	-	-	1	1	2	SEE (viva voce)	50	50
		TOTAL	21	0	5	26	31			

**CIE** = CONTINUOUS INTERNAL EVALUATION

**SEE** = SEMESTER END EXAMINATION

### EVALUATION PATTERN: Marks allocation for SEE

Subject Code	Subject Name	Design	Drawing	Viva Voce	Book Review/ Model	Total
<b>AR501</b>	<b>Architectural Design - IV (SEE Viva Voce)</b>	20	15	10	5	50

Subject Code	Subject Name	Portfolio	Viva	Total
<b>AR502</b>	<b>Building Materials &amp; Construction Technology V (SEE Viva Voce)</b>	40	10	50

Subject Code	Subject Name	Portfolio	Viva	Total
<b>AR508</b>	<b>Study Tour (SEE Viva Voce)</b>	30	20	50

**Note:**

- Literature survey will be a requirement for Architectural Design study. Periodic review will be conducted by external juror for subjects going for viva voce.
- National / International tours may be arranged during vacation for students, to study examples of architecture.
- For all viva voce examinations one internal faculty and one external faculty will conduct the exam.
- Portfolios must be submitted on prescribed date announced by the department for all the subjects for one year.
- All students must register on the first day at the beginning of the **Viva voce exam**.

**SCHEME OF TEACHING & EXAMINATION - VI SEMESTER B. ARCH**  
**ACADEMIC YEAR 2023 – 2024**

2021 Batch			Teaching scheme per week					Examination scheme		
Sl. No	Code	Subject	Lecture / Studio	Tutorial	Practical (Study Tour/ Case Study)	Total	Contact hours	Exam	CIE Marks	SEE Marks
1	AR 601	Architectural Design V	6	0	1	7	8	SEE (Viva voce)	50	50
2	AR 602	Building Materials & Construction Technology VI	3	0	1	4	5	SEE (Viva voce)	50	50
3	AR 603	Research Methodology	2	0	0	2	2	SEE	50	50
4	AR 604	Estimation & Costing	3	0	0	3	3	SEE	50	50
5	AR 605	Architectural Structures VI	3	0	0	3	3	SEE (Term work)	50	50
6	AR 606	Building Services IV	3	0	0	3	3	SEE	50	50
7	AR 607	Disaster Management	2	0	0	2	2	SEE	50	50
8	AR 608	Working Drawing I	0	0	2	2	5	SEE (Viva voce)	50	50
		TOTAL	22	0	4	26	31			

**CIE** = CONTINUOUS INTERNAL EVALUATION

**SEE** = SEMESTER END EXAMINATION

### EVALUATION PATTERN: Marks allocation for SEE

Subject Code	Subject Name	Design	Drawing	Viva Voce	Book Review/ Model	Total
<b>AR601</b>	<b>Architectural Design – V (SEE Viva Voce)</b>	20	15	10	05	50

Subject Code	Subject Name	Portfolio	Viva	Total
<b>AR602</b>	<b>Building Materials &amp; Construction Technology VI (SEE Viva Voce)</b>	40	10	50
<b>AR608</b>	<b>Working Drawing I (SEE Viva Voce)</b>	40	10	50

#### Note:

- Literature survey will be a requirement for Architectural Design study. Periodic review will be conducted by external juror for subjects going for viva voce.
- For all viva voce examinations one internal faculty and one external faculty will conduct the exam.
- Portfolios must be submitted on prescribed date announced by the department for all the subjects for one year.
- All students must register on the first day at the beginning of the **Viva voce exam**.
- All students must register on the first day of **Term work exams**.

## V Semester

ARCHITECTURE DESIGN - IV	
Subject Code: AR501	Credits: 6:0:1
Pre requisites: Nil	Contact Hours: 8 hours/ Week
Course Coordinator: Dr. Pushpa Devanathan	

### Course objectives:

The students will be exposed to -

- The need for creating architecture in an urban setting.
- To identify and understand the role of services in the design of buildings; significance of material and construction techniques; climatic factors.
- The role of symbolism, aesthetics, and function in architecture, and the influence of socio-cultural, economic dimensions; user perception.

### Course contents

#### Unit I

Design of a multi-functional public building in an urban setting.

Introduction to multi-functional public building design parameters in an urban setting.

Introduction to criticism in architecture. Introduction to behavioural science in design of public buildings. Introduction to barrier-free design

#### Unit II

Exercise in Design processes, exercise in development of program required/ schedule based on Literature and Case studies

#### Unit III

Exercise in site model development and discussion on impact of urban settings on Architectural Design. Site Analysis based on observational study.

#### Unit IV

Design development for site, building layouts, built form in alignment with building byelaws. Site Plan at scale 1:500/ 1:1000, Plans and sections at scale 1:100



## Unit V

Exercise in presenting criticism on Architectural Design. Exercise in highlighting components of behavioural science applied to design.

Suggested building typologies: Museums, art galleries, hotels, shopping arcades/ malls. Multi-use buildings such as Schools, Nursing homes, Office complexes, Performing arts Centre.

NOTE: The design shall be sensitive to the needs of the disabled, aged people and children.

### References:

1. Site Analysis - Edward T. White
2. Commercial Building Design: Integrating Climate, Comfort - Burt Hill Kosar Rittelmann Associates
3. The Architect's Studio Companion: Rules of Thumb for Preliminary Design by Edward Allen and Joseph Iano
4. John Callender, 'Time-saver Standards for Architectural Design Data'; McGraw-Hill, 1982
5. Ernst Neufert, 'Architects' Data'; Wiley Blackwell, 2019
6. Richard Patrick Parlour, 'Building Services: A Guide to Integrated Design: Engineering for Architects'; Integral Publishing, 1997
7. Paul Tymkov, Savvas Tassou, Maria Kolokotroni, Hussam Jourhara, 'Building Services Design for Energy Efficient Buildings'; Routledge, 2013
8. Russell Fortmeyer, Charles F Linn, 'Kinetic Architecture: Designs for Active Envelopes'; Images Publishing Group, 2013
9. Michael Fox, 'Interactive Architecture: Adaptive World'; Princeton Architectural Press, 2016
10. Christopher Alexander, 'A Pattern Language: Towns, Buildings, Construction'; Oxford University Press, 2018
11. Grant W. Reid, 'Landscape Graphics: Plan, Section, and Perspective Drawing of Landscape Spaces'; Watson-Guptill, 2002
12. Jan Gehl, 'Life between Buildings'; Island Press, 2011
13. Margaret Huffadine, 'Resort Design: Planning, Architecture and Interiors'; McGraw-Hill Education, 1999
14. Edward. D., Mills, "Planning the Architects Hand Book - Butterworth, London, 1985.
15. Prof. A.K. Bansal; Solar Passive Design.

**Course outcomes (COs):**

Students will be able to -

1. Design buildings in urban settings. (PO1, PSO1)
2. Integrate developmental controls, codes, and byelaws in their design. (PO1, PSO2)
3. Articulate and criticize qualitative attributes of the spatial components of a multi-use and multi-user program. (PO4, PSO1)
4. Develop the area program and design methodology. (PO3, PSO1)
5. Explore various architectural concepts and their adaptation, also develop presentation techniques. (PO2, PSO1)

**Evaluation Pattern:** Marks allocation for SEE

<b>Subject Code</b>	<b>Subject Name</b>	<b>Design</b>	<b>Drawing</b>	<b>Viva Voce</b>	<b>Model / Book Review</b>	<b>Total</b>
AR501	Architectural Design – IV (SEE Viva Voce)	20	15	10	5	50

<b>BUILDING MATERIALS &amp; CONSTRUCTION TECHNOLOGY – V</b>	
<b>Subject Code: AR502</b>	<b>Credits: 3:0:1</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 5 hours/ Week</b>
<b>Course Coordinator: Prof. Vishwas Hittalmani</b>	

### **Course Objectives:**

Students are introduced to -

- The construction methods/ details of special doors and windows in aluminium/ steel.
- The fundamental principles of structural glazing and cladding and detailing.
- Understand medium span roofing systems.

### **Course Contents**

#### **Unit I**

Doors and windows: various building components like aluminum doors & windows and partitions, frameless glass doors and partitions, rolling shutter and collapsible shutter, Steel windows. Methods of fabrication with joinery details.

#### **Unit II**

Curtain wall systems: cladding, glazing, structural glazing, composite panels with specifications of materials with joinery details

#### **Unit III**

Foundations and medium span roof systems: Medium span steel roof truss, north light truss etc.

#### **Unit IV**

Material study: Anti-termite treatment to foundation, Masonry walls and woodwork, Water proofing materials and weather proofing materials like chemical admixtures and surface applications.

#### **Unit V**

Glass: Manufacture and various types such as plate, tinted, decorative, reinforced, laminate glass block and fiber glass, etching etc. fiber reinforced composite products and their applications.

## References:

1. Glenn M. Hardie, 'Building Construction Principles, Practices and Materials';
2. Pearson, 1995
3. Abit Metin, 'Window in Progress...50 Ideas for Your Shop Windows'
4. John Birchard, 'Make Your Own Handcrafted Doors & Windows'; Echo Point
5. Books & Media, 2014
6. Designer Railings and Grills: For Balconies, Boundaries etc.; Goodwill Publishing
7. House, 2019
8. Victorian Architectural Details: Designs for Over 700 Stairs, Mantels, Doors,
9. Windows, Cornices, Porches, and Other Decorative Elements; A. J. Bicknell &
10. Co., 2010
11. Alan J. Brookes and Maarten Meijs, 'Cladding of Buildings'; Taylor & Francis,
12. 2008
13. Francis D. K. Ching, 'Building Construction Illustrated'; John Wiley & Sons,
14. 2014
15. W. B. McKay, 'Building Construction – Vol 1-5'; Pearson Education India, 2013,
16. Roy Chudley, 'Construction Technology'; Pearson Education, 2014
17. R. Barry, 'Construction of Buildings - Vol 1'; Wiley-Blackwell, 1999
18. Arthur Lyons, 'Materials for Architects and Builders'; Routledge, 2019
19. P. C. Varghese, 'Building Materials'; Prentice Hall India Learning Pvt. Ltd., 2015

## Course Outcomes (COs):

The students will be able to -

1. Identify the basic components of special doors, windows and their construction methods. (PO1, PSO2)
2. Draft and read architectural drawings and construction details for cladding and structural glazing. (PO3, PSO1)
3. Analyze and draw details of a truss. (PO3, PSO2)
4. Understand different materials and their applications in building. (PO1, PSO2)
5. Generate innovative details in construction. (PO2, PSO2)

## Evaluation Pattern: Marks allocation for SEE

Subject Code	Subject Name	Portfolio	Viva	Total
AR502	Building Materials & Construction Technology V (SEE Viva Voce)	40	10	50

<b>CONTEMPORARY ARCHITECTURE</b>	
<b>Subject Code: AR503</b>	<b>Credits: 3:0:0</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 3 hours/ Week</b>
<b>Course Coordinator: Assoc. Prof. Sudha Kumari</b>	

### **Course Objectives:**

To enable the students to -

- Understand contemporary architectural trends
- Understand the ideas and philosophies of architects
- Study the contemporary architectural styles in detail.

### **Course Contents**

#### **Unit I**

Trends in contemporary architecture – Introduction and brief understanding, appreciation and comparison of general contemporary trends in India – Pre independence: British Colonial- Victoria memorial hall, Calcutta, Post-independence: Le Corbusier – High court Chandigarh, Charles Correa – The Kovalam resort, Trivandrum, Jawahar kala Kendra, B V Doshi IIM, Bangalore. Contemporary western architecture focusing on understanding, appreciation, ideas and directions through the works of notable architects.

#### **Unit II**

Ideology and philosophy of Santiago Calatrava: Zoomorphism. Study works of Santiago Calatrava and Daniel Libeskind: Commemorative Architecture, deconstruction. Study works - ideology and philosophy of: Zaha Hadid, Rem Koolhaas, Frank O Gehry – Blobitecture. Ar. Norman foster, Ar. Tadao Ando, Ar. I M Pei.

#### **Unit III**

Ideology, Philosophy & Study works of Greg Lynn, Diller & Scofidio: Digital Architecture.

Genetic Algorithm, Cybertecture and digital architecture and examples.

#### **Unit IV**

Post-independence architecture in India- ideology and philosophy of: Louis I Kahn. Laurie Baker: eco-friendly & vernacular architecture, ideology and philosophy & study works of Le Corbusier.

## Unit V

Ideology and philosophy of Charles Correa: architecture of changing time and philosophy. Study works of Hafeez Contractor, ideology and philosophy of B.V. Doshi. Symbolism and Nationalism Ar. Raj Rewal & works of regional architects.

### References:

1. Colin Naylor, Ann Lee Morgan, 'Contemporary architects'; St. James Press, 1987
2. Christine Kilroy, Rene Davids, 'Details in Contemporary Architecture: As Built';
3. Princeton Architectural Press, 2007
4. Juhani Pallasmaa, 'The Eyes of the Skin: Architecture and the Senses'; Wiley,
5. 2012
6. 4. Lawrence Cahoon, 'From Modernism to Postmodernism'; Wiley-Blackwell, 2003
7. Jennifer Ashton, 'From Modernism to Postmodernism: American Poetry and
8. Theory in the Twentieth Century'; Cambridge University Press, 2008
9. Kenneth Frampton, 'Modern Architecture: A Critical History'; Thames and
10. Hudson, 2007
11. Sigfried Giedion, 'Space Time and Architecture – The Growth of a New
12. Tradition'; Harvard University Press, 2008

### Course outcomes (COs):

Students will be able to -

1. Understand the evolution of contemporary architecture and analyse various contemporary architecture trends in Indian and World architecture. (PO1, PSO1)
2. Analyse the philosophies of zoomorphism, deconstruction, commemorative architecture and blobitecture through examples and identify works based on philosophies. (PO1, PSO1)
3. Recognize the need and ideologies of digital architecture. (PO1, PSO1)
4. Draw conclusions through insight into the post-independence architecture in India and its recognition of eco-friendly and vernacular designs. (PO1, PSO1)
5. Identify the influences and the changes in Indian architecture through time. (PO1, PSO1)

<b>SOCIOLOGY AND ECONOMICS</b>	
<b>Subject Code: AR504</b>	<b>Credits: 1:0:1</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 3 hours/ Week</b>
<b>Course Coordinator: Asst. Prof. Divya Susanna Ebin</b>	

### **Course Objectives:**

To familiarize students with -

- Basic concepts of Sociology.
- Basic concepts of Economics.
- Influences of Sociology and Economics on Architecture.

### **Course contents**

#### **Unit I**

Introduction to Sociology: Nature, Scope, Utility of Sociology, Branches of Sociology, Relevance of Sociology to Architecture and the built environment.

Elements of Society: Definitions of Sociological terms - society, community, family, culture; difference between society and community; relation between culture and built form.

#### **Unit II**

Communities: Origin, growth and nature of settlements and communities; their characteristics and spatial patterns.

Urban and Rural Communities: Definitions of the terms 'urban' and 'rural'. The social, economic, and spatial characteristics associated with urban and rural settlements.

Cities & Society: Urbanization – definition, causes of urbanization, impact of urbanization on urban life, viz. health, housing, transportation, different types of migration, Official definition of slums as per Census of India, characteristics of slums in India.

#### **Unit III**

Social research: The need for research, the research process. Sources of research data:

Primary and secondary sources: Primary data sources methods such as surveys, fieldwork, experiment, and case study approach. Secondary data sources include literature review, official and unofficial documents.

## **Unit IV**

Economics: Definition of Economics; Definition of terms – Goods, Utility, Value, Price and Wealth.

Economic Organization of society: Different economic systems – capitalism, socialism, communism, mixed economies. Primary, secondary, and tertiary sectors of economy – agriculture, mining, manufacturing, banking, marketing, transport and service sectors. Factors of production – land, labor, capital, and entrepreneurship. Relevance of factors of production to architecture and construction practice.

## **UNIT - V**

Economics and the market: Consumption, wants and needs and their characteristics. Concepts of economics – Opportunity cost; Laws of supply and demand; Laws of increasing, diminishing and constant returns; Standard of living.

Urban land values: Characteristics of developed land in the city. The Bid Rent theory that defines relationship between location and land value.

Building Costs: Life cycle costs, Total cost of construction, Time value of money. Different sources of financing buildings.

### **References:**

1. Neil Joseph Smelser, 'Handbook of Sociology'; SAGE Publications, 1988
2. Jan Lin, Christopher Mele, 'The Urban Sociology Reader'; Routledge 2012
3. Veena Das, 'Handbook of Indian Sociology'; Oxford, 2006
4. Open Stax, 'Introduction to Sociology'; XanEdu Publishing Inc, 2015
5. Neil J. Smelser, R. Stephen Warner, 'Sociological Theory: Historical and Formal; General Learning Press, 1976
6. Linda Groat, David Wang, 'Architectural Research Methods', Wiley India Exclusive, 2018
7. Paul Samuelson William Nordhaus, 'Economics'; McGraw Hill Education, 2010

### **Course Outcomes (COs):**

The students will be able to -

1. Identify the social behavior of a society. (PO6, PSO1)
2. Outline the relationship between Sociology, architecture & the urban context. (PO6, PSO1)
3. Understand social research. (PO6, PSO1)
4. Understand the different economic considerations in a society. (PO6, PSO1)
5. Explain the relationship between Economics and building costs. (PO6, PSO1)



<b>ARCHITECTURAL STRUCTURES – V</b>	
<b>Subject Code: AR505</b>	<b>Credits: 3:0:0</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 3 hours/ Week</b>
<b>Course Coordinator: Asst. Prof. M. Vijayanand</b>	

### **Course Objectives:**

To expose the students to -

- the concept and prestressing system, losses involved in the design methods of PSC elements.
- the design of structural steel members including connections.
- the design concept of masonry walls and understanding the concepts of special structural forms.

### **Course Contents**

#### **Unit I**

Principle of Prestressing: Introduction- Materials for Prestressed concrete, System and method of prestressing, analysis of sections, stress and strength concept, load balancing concept, effect of loading on tensile stresses in the tendons.

#### **Unit II**

Losses of PSC members: Analysis method of losses, elastic shortening, shrinkage of concrete, creep of concrete, relaxation, anchorage slip, friction. Use of IS1343:1980 Code

#### **Unit III**

Connections: Bolted connection, Introduction- code of practice- bearing and friction type of bolts- joints subjected to moment and direct load and Welded connections, Introduction- code of practice – butt and fillet welds- weld symbols- joints subjected to shear and bending - joints subjected to shear and torsion. Use of IS800 & SP6 Code

#### **Unit IV**

Tension Member: Introduction- types of tension member- design consideration – design of tension members. Use of IS800 & SP6 Code

## Unit V

Masonry Structures, Special Structural forms, and Tall buildings: Introduction to Masonry structure, design concepts, concept of Shell, folded plate, domes, grid structure, flat slab, tensile and pneumatic structure, and tall building concept.

### References:

1. S. K. Duggal, 'Limit State Design of Steel Structures'; McGraw Hill Education, 2017
2. N. Krishna Raju, 'Prestressed Concrete'; McGraw Hill Education, 2012
3. K. U. Muthu, Ibrahim Azmi, Janardhana Maganti, M. Vijayanand, 'Prestressed Concrete'; PHI Learning, 2016
4. 4. Alfredo Boracchini, 'Design and Analysis of Connections in Steel Structures: Fundamentals and Examples'; Ernst & Sohn, 2018

### Course Outcomes (COs):

The students will be able to:

1. Describe the principle of PSC and role of HSC and steel and design methods of PSC elements by the principles and requirements for prestressed concrete design and code of practice. (PO3, PSO2)
2. Evaluate the initial and time dependent losses. (PO4, PSO2)
3. Demonstrate the connection subjected to moment and also to describe the concept of butt and fillet weld connections, design the welded joints subjected to shear and bending. (PO3, PSO2)
4. Illustrate the design of tension member and identify the friction type and bearing type of bolts. (PO3, PSO1,2)
5. Incorporate the concept of masonry wall, classification of walls, shells, domes, flat slab, pneumatic structures, grid structures, tensile structure. (PO3, PSO2)

<b>BUILDING SERVICES – III</b>	
<b>Subject Code: AR506</b>	<b>Credits: 3:0:0</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 3 hours/ Week</b>
<b>Course Coordinator: Prof. Vishwas Hittalmani</b>	

### **Course Objectives:**

To enable the students to -

- Study mechanical services in a building
- Integrate services with architectural design

### **Course Contents**

#### **Unit I**

Mechanical ventilation, ventilation for a cinema hall, Air-conditioning for human comfort & definitions, dust control and filters

#### **Unit II**

Air cycle, refrigeration cycle, components, air distribution - ducts, grilles etc., classification and application air-conditioning, heat load estimation & thumb rules.

#### **Unit III**

Window unit, split units without ducts, split unit with duct, package unit with ducts, direct Expansion system, Chilled Water System, humidifiers & dehumidifiers.

#### **Unit IV**

Introduction to vertical circulation, lift well, pit, doors, car, machine room etc. Typical section through lift, quality & quantity of service, types of lifts, lift bank, lobby and lift interiors, hydraulic & traction lift, escalator & travelator.

#### **Unit V**

Lift act, architect's role, double Decker lift, sky lobby, current scenario.

### **References:**

1. David V. Chadderton, 'Building Services Engineering'; Routledge, 2012
2. Ashfaq Hasan, 'Understanding Mechanical Ventilation'; Springer, 2010

3. Roy J. Dossat, 'Principals of Refrigeration'; Pearson Education India, 2002
4. Aly S. Dadras, 'Mechanical Systems for Architects'; McGraw-Hill Inc., 1994
5. Rex Miller, Mark R. Miller, 'Air Conditioning and Refrigeration'; McGraw-Hill Education, 2011
7. Theodore Lee Jarboe and John J. O'Donoghue, 'Elevator & Escalator Rescue: A Comprehensive Guide'; PennWell Books, 2007
8. George R. Strakosch , 'Vertical Transportation: Elevators and Escalators'; John Wiley & Sons, 1983
9. Manohar Prasad, 'Refrigeration and Airconditioning Data Book'; New Age International Pvt. Ltd., 2010
10. Arora, Domkundwar, 'A Course in Refrigeration and Air- Conditioning'; Dhanpat Rai & Co
11. Walter T. Grondzik, Alison G. Kwok, Benjamin Stein, John S. Reynolds, Mechanical and Electrical Equipment for Buildings'; John Wiley & Sons, 2009
12. Shan K Wang, 'Handbook of Air Conditioning and Refrigeration', McGraw-Hill Education, 2000
13. "National Building Code of India (NBC) 2016"; Part 8 Section 3 and 5 & Part 3 & 4; Bureau of Standards,
14. IS Codes –
  - 1391 (Part 1 & 2): 1992 - Specification for room air conditioners
  - 8148: 2003 - Specification for packaged air conditioners
  - 4591: 1968 - Code of practice for installation and maintenance of escalators
  - 14671: 1999 - Hydraulic lifts
  - 14665: 2000 - Traction lift
  - 15259: 2002 - Home Lifts 15330: 2003 - Lifts for handicapped persons

### **Course Outcomes (COs):**

The students will be able to -

1. Incorporate mechanical services in a building. (PO5, PSO2)
2. Explain fundamentals of air conditioning. (PO5, PSO2)
3. Integrate the understanding of air conditioning in their architectural design. (PO3, PSO2)
4. Provide vertical circulation in a building as per requirements and context. (PO5, PSO2)
5. Apply prevailing acts and norms while designing mechanical lifts for any building. (PO1, PSO2)

LANDSCAPE DESIGN	
<b>Subject Code: AR507</b>	<b>Credits: 2:0:1</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 4 hours/ Week</b>
<b>Course Coordinator: Assoc. Prof. Surekha R.</b>	

### Course Objectives:

To expose the students to -

- Introduction of Landscape Design
- Integration of landscape design with architectural design
- Develop basic skills required to handle simple landscape design projects

### Course Contents

#### Unit I

**Introduction of Landscape Design:** Historical overview of garden design; types of gardens. Fundamental principles of landscape design.

Introduction to primary landscape elements: landform, water, and vegetation.

#### Unit II

**Introducing Planting Design and Plant selection:** Basic classification of Plant material - Trees, shrubs, creepers, and ground covers.

Taxonomy, units of taxonomy, systems of classification, Botanical names, and common names of plant materials. Site visits to identify various plants.

#### Unit III

**Site Analysis and Site Planning Principles:** Aspects of site analysis such as topography, soil, climate, wind, site slope, natural systems, services, and vegetation.

#### Unit IV

**Works and Philosophies of Landscape Architects:** Works of William Kent, Capability Brown, Humphry Repton, Frederick Law Olmstead

Works of Contemporary landscape architects - Martha Schwartz, Peter Walker, Pamela Burton, James Corner, Turenscape etc

Landscape architects from India – Ravindra Bahn, Mohammed Shaheer.

## Unit V

**Introduction to secondary landscape elements:** Street furniture, landscape walls, paving, ground covers, trellises, outdoor shading structures. Hard and soft landscape. Demonstrate the understanding of the landscape design – suggested projects include small scale open spaces, terrace gardens, entrance/ frontage to a public building, community garden etc.

### References:

1. John Ormsbee Simonds, Barry Starke, 'Landscape Architecture'; McGraw-Hill Education, 2006
2. Michael Laurie, 'Introduction to Landscape Architecture'; Elsevier Science Ltd, 1986
3. 3. Kapila D. Silva, Amita Sinha, 'Cultural Landscapes of South Asia: Studies in Heritage Conservation and Management'; Routledge, 2016
4. Thomas Russ, 'Site Planning and Design Handbook'; McGraw-Hill Education, 2009
5. Harvey M. Rubenstein, 'A Guide to Site Planning and Landscape Construction'; John Wiley & Sons, 1996
6. William S. Saunders, 'Daniel Urban Kiley: The Early Gardens'; Princeton Architectural Press, 1999
7. William H. Whyte, 'The Social Life of Small Urban Spaces'; Project for Public Spaces Inc, 1980
8. John L. Motloch, 'Introduction to Landscape Design'; John Wiley & Sons, 2000
9. Robert Holden, Jamie Liversedge, 'Landscape Architecture: An Introduction'; Laurence King Publishing, 2014
10. Christophe Girot, 'The Course of Landscape Architecture: A History of Our Designs On the Natural World: from Prehistory to the Present'; Thames and Hudson, 2016
11. James A. Lagro, 'Site Analysis: A Contextual Approach to Sustainable Land Planning and Site Design'; John Wiley & Sons, 2007
12. Mohammad Shaheer, Geeta Wahi Dua, Adit Pal, 'Landscape Architecture in India, A Reader'; LA, Journal of Landscape Architecture, 2013

**Course outcomes (COs):**

The students will be able to -

1. Understand the fundamental concepts and ideas in the field of landscape architecture. (PO1, PSO 1, 2)
2. Explain basics of planting in Landscape Design. (PO1, PSO1)
3. Integrate Landscape Design in architecture and site planning. (PO2, PSO1)
4. Explain the application of various philosophies in Landscape Design. (PO1, PSO1)
5. Develop landscape designs for small scale projects. (PO3, PSO2)

<b>STUDY TOUR</b>	
<b>Subject Code: AR508</b>	<b>Credits: 0:0:1</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 2 hours/ Week</b>
<b>Course Coordinator: Assoc. Prof. Meghana Raj</b>	

### **Course Objectives:**

To expose the students to -

- Understand the evolution of the building process.
- Understand existing projects.
- Understand various elements of buildings and their transformation over the years.

### **Course Contents**

Site visits to include Modern and Additional Architectural styles, theories practiced through built spaces their evolution and influences.

1. Study of Construction Techniques and Materials used is to be integral part of study Team
2. Portfolio consists of Documentation and Analysis of the visited buildings

### **Course Outcomes (COs):**

The students will be able to -

1. Measure and complete the measured drawing of simple buildings. (PO1, PSO1)
2. Represent different elements of architecture. (PO1, PSO1)
3. Translate their ideas in the form of drawings. (PO1, PSO1)

### **Evaluation Pattern:** Marks allocation for SEE

<b>Subject Code</b>	<b>Subject Name</b>	<b>Portfolio</b>	<b>Viva</b>	<b>Total</b>
AR508	Study Tour (SEE Viva Voce)	40	10	50



## VI Semester

ARCHITECTURE DESIGN – V	
Subject Code: AR601	Credits: 6:0:1
Pre requisites: Nil	Contact Hours: 8 hours/ Week
Course Coordinator: Dr. Pushpa Devanathan	

### Course Objectives:

To enable the students to -

- Understand the design principles of campus planning and large-scale projects
- Create an identity to the campus through integration of various parameters, functional areas, options of structural possibilities, site, traffic and bye laws
- Designs have to respond to climate, environmental and ecological factors. Site planning, landscape details, circulation and services, structural viability and interiors have to be addressed.

### Course contents

#### Unit I

Introduction to campus planning and Case studies of campuses. Data collection including relevant bye laws.

Aspects to be addressed can be sustainable building practices, green issues, alternative energy, intelligent building techniques and service integration, advanced building practices, appropriate materials and construction, sensitive and optimal use of resources, contour site design.

#### Unit II

Site analysis including analysis of contours.

#### Unit III

Site planning and developing the campus master plan with model.

#### Unit IV

Detailing of a common major block like auditorium, library etc. (Plans, Sections, Elevations, 3D)

## Unit V

Detailing any two academic blocks.

NOTE: The design shall be barrier free and sensitive to the needs of the, aged people and children.

Suggested building typologies: Institutional projects like facilities of higher learning, such as, Engineering college campus, Medical college campus, Management Institute campus, Hotel management institute, Law college campus, Dental college campus, Nursing college campus, Juvenile Correction Centre, etc.

### References:

1. Joseph De Chiara, Michael J. Crosbie, 'Time Saver Standards for Building Types'; McGraw Hill Education, 2017
2. Donald Watson, Michael Crosbie, John Callender, 'Time Saver Standards for a. Architectural Design Data'; McGraw-Hill Education, 1997
3. Ernst Neufert, 'Architects' Data'; Wiley-Blackwell, 2019
4. Anne M. Schmid, Mary Scoviak-Lerner, 'International Hotel and Resort Design'; PBC International 1988
5. Jan Gehl, 'Life between Buildings'; Island Press, 2011
6. Richard P Dober, 'Campus Architecture: Building in the Groves of Academe'; McGraw-Hill Education, 1996
7. Robert Simha, 'MIT Campus Planning 1960–2000 – An Annotated Chronology'; MIT Press, 2003
8. Mildred F Schmertz, 'Campus Planning and Design'; McGraw-Hill, 1972
9. Thomas A. Gaines, 'The Campus as A Work of Art'; Praeger Publishers Inc, 1991
10. C. Carney Strange, James H. Banning, 'Educating by Design: Creating Campus Learning Environments That Work'; Jossey Bass, 2000
11. Roger H. Clark and Michael Pause, 'Precedents in Architecture'; Wiley, 2012
12. Geoffrey H Baker, 'Le Corbusier - An Analysis of Form'; Taylor & Francis, 1996
13. Herman Hertzberger, 'Lessons for Students in Architecture'; Uitgeverij, 2005
14. Charles Correa, 'A Place in The Shade'; Penguin India, 2010
15. Rem Koolhaas, 'Conversations with Students'; Princeton Architectural Press, 1996

**Course Outcomes (COs):**

The students will be able to –

1. Understand the scale of campus plan and applicable bye laws. (PO3, PSO2)
2. Develop architectural design for built forms and unbuilt spaces in campus in cohesive manner. (PO3, PSO2)
3. Apply and integrate learning of contours detailing space, space planning principles in campus designing to develop master plan. (PO1, PSO2)
4. Integrate circulation, services, structural aspects in design and evolve interior details. (PO3, PSO2)
5. Respond to climate, environment, and ecological factors. (PO3, PSO2)

**Evaluation Pattern:** Marks allocation for SEE

<b>Subject Code</b>	<b>Subject Name</b>	<b>Design</b>	<b>Drawing</b>	<b>Viva Voce</b>	<b>Book Review/ Model</b>	<b>Total</b>
AR601	Architectural Design – V (SEE Viva Voce)	20	15	10	05	50

<b>BUILDING MATERIALS &amp; CONSTRUCTION TECHNOLOGY – VI</b>	
<b>Subject Code: AR602</b>	<b>Credits: 3:0:1</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 5 hours/ Week</b>
<b>Course Coordinator: Prof. Vishwas Hittalmani</b>	

### **Course Objectives:**

To enable students to –

- Comprehend and apply knowledge of advanced roofing technologies for large span and complex buildings.

### **Course contents**

#### **Unit I**

Space frames and Geodesic domes (drafting): Introduction to Space frames and Geodesic domes, components used, advantages and disadvantages, fixing details, construction details, Methods of construction, application and details of reinforcement

#### **Unit II**

RCC Folded plate, Large Span truss / steel portal frames (drafting): Introduction to RCC Folded plate and Large span truss, advantages and disadvantages, fixing details, construction details

Methods of construction, application and details of reinforcement

#### **Unit III**

Tensile and Pneumatic structures and materials (sketching): Introduction to Tensile and Pneumatic structures, advantages, and disadvantages, fixing details, construction details. Properties and usage of Synthetic material

#### **Unit IV**

Shell roofs and materials (sketching): Introduction to advantages and disadvantages of Shell roofs, fixing details, construction details.

#### **Unit V**

Properties and usage of Insulation materials– Thermal and Sound Insulation Materials, Fire retardant materials, ethylene tetrafluoroethylene.

Technical information to be discussed.

### References:

1. Roy Chudley, 'Construction Technology'; Pearson Education, 2014
2. R. Barry, 'Construction of Buildings - Vol 1'; Wiley-Blackwell, 1999
3. P. C. Varghese, 'Building Materials'; Prentice Hall India Learning Pvt. Ltd., 2015
4. S. P. Arora & S. P. Bindra, 'A Text-Book of Building Construction'; Dhanpat Rai & Co., 2010
5. G.S. Ramaswamy, 'Design and Construction of Concrete Shell Roofs'; CBS, 2005
6. Rob Whitehead, 'Structures by Design: Thinking, Making, Breaking'; Routledge, 2019
7. John Chilton, 'Space Grid Structures'; Routledge, 2007
8. Terri Meyer Boake, 'Architecturally Exposed Structural Steel: Specifications, Connections, Details'; Birkhauser, 2015
9. Robert H. Kronenburg, Todd Dalland, Nicholas Goldsmith, 'Future Tents Limited (FTL) Architects: Innovations in Tensile Structures'; John Wiley & Sons, 1997
10. Mark R. Cruvellier, Bjorn N. Sandaker, Luben Dimcheff, 'Model Perspectives: Structure, Architecture and Culture'; Routledge, 2016
11. Arthur Lyons, 'Materials for Architects and Builders'; Routledge, 2014

### Course Outcomes (COs):

The students will be able to -

1. Understand the working principles and construction details of space frames and geodesic domes. (PO1, PSO1)
2. Provide advanced roofing technologies for large span structures. (PO1, PSO2)
3. Formulate structural mechanics, design criteria and behaviour of tensile and pneumatic structures. (PO3, PSO2)
4. Explain design criteria and behaviour of shell roofs. (PO1, PSO2)
5. Use innovative materials and details in construction. (PO1, PSO2)

### Evaluation Pattern: Marks allocation for SEE

Subject Code	Subject Name	Portfolio	Viva	Total
AR602	Building Materials & Construction Technology VI (SEE Viva Voce)	40	10	50

<b>RESEARCH METHODOLOGY</b>	
<b>Subject Code: AR603</b>	<b>Credits: 2:0:0</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 2 hours/ Week</b>
<b>Course Coordinator: Assoc. Prof. Dr. Monalisa</b>	

### **Course Objectives:**

To enable the students to -

- Understand concepts of research and its importance in the field of architecture.
- Understand the research methods and methodology.
- Know styles and format of writing research paper.

### **Course contents**

#### **Unit I**

Introduction of the subject and its relevance to architectural field and society,  
Introduction: Introduction to Research Methodology, Meaning of Research, Objectives, Types, Approaches, Significance, Tools.

#### **Unit II**

Research methods and methodology, Research process, Research design, Research hypothesis. Problem Definition, Objectives, Design, Data Collection, Data Analysis, Interpretation of Results, Validation of Results.

Research Problem Identification: Identification of Research Problem, Classroom Exercise of selecting a research problem, Identification of need to define research problem, Techniques involved in defining the Research Problems.

Research Hypothesis: Boundaries of Study, questions and possible hypothesis, formulation of a hypothesis

Research Design: Need, Characteristics of a good Design and related concepts, Types and Basic Principles of Research Designs: Classroom Exercises.

#### **Unit III**

Sampling fundamentals, measurement and scaling techniques, Data collection. Research Design: Selection of Research Approach, Designing of Sampling Plan, Experiments and Questionnaires, methods: Probability and Non-probability samples.

Sampling Design: need, types, methods, characteristics of a good sample design, steps in sampling design, criteria for selecting sampling procedure and random sample for

an infinite universe – Urban Problems.

#### **Unit IV**

Data analysis and interpretation of results and report writing. Data Collection: Types and Collection Methods, Primary and Secondary data, sources of data, method to select appropriate data collection method. Significance, Steps, Layout of Report, Types of Reports, Mechanics of Writing, Precautions, Guidelines for reviewing drafts, Report formats, Typing Instructions

#### **Unit V**

Future research and role of computers in architecture. Classroom Exercise: Very Small Sample Classroom Research Project – 1 and enable students to get practically acquainted with the Research Methodology to carry out future researches.

#### **References:**

1. C. R. Kothari, Gaurav Gard, 'Research Methodology: Methods And Techniques'; New Age International Publishers, 2019
2. O.R. Krishnaswamy, M. Ranganatham, 'Methodology of Research In Social Sciences'; Himalaya Publishing House, 2011
3. R. Panneerselvam, 'Research Methodology'; PHI Learning, 2014
4. Ranjit Kumar, 'Research Methodology: A Step by Step Guide for Beginners'; SAGE Publications Ltd, 2010
5. Ram Ahuja, 'Research Methods'; Rawat Publications, 2001
6. Linda N. Groat, David Wang, 'Architectural Research Methods'; Wiley, 2013
7. Bill Schmalz, 'The Architect's Guide to Writing; For Design and Construction Professionals'; Images Publishing Group; 2014
8. Karl Popper, 'The Logic of Scientific Discovery'; Roulledge, 2002

#### **Course Outcomes (COs):**

The students will be able to -

1. Conduct research on different aspects of the built environment. (PO1, PSO1)
2. Understand the steps involved in conducting research and their importance. (PO1, PSO1)
3. Identify the appropriate methods of sampling for the urban issues being researched. (PO4, PSO2)
4. Explore the process of research with respective data collection and data analysis. (PO4, PSO2)
5. Write reports or research papers. (PO10, PSO2)

<b>ESTIMATING AND COSTING</b>	
<b>Subject Code: AR604</b>	<b>Credits: 3:0:0</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 3 hours/ Week</b>
<b>Course Coordinator: Prof. Vishwas Hittalmani</b>	

### **Course objectives:**

To enable students to -

- To achieve proficiency in building estimation.
- To develop necessary skill for writing specification.
- To have practical knowledge of building industry, practice, and cost comparison

### **Course contents**

#### **Unit I**

Introduction: Importance of estimation, Types of estimates, concept of measurement and Units of measurement. Area calculation of Plinth area, floor area, circulation area and carpet area.

Definitions of Bill of Quantities (BOQ) and Bill of Materials (BOM), Administrative approval, Schedule of rates, Measurement book, Workcharged establishment, contingencies.

#### **Unit II**

Building components: Estimation of RCC framed structure components and load bearing wall structure components by long wall-short wall method or center line method.

#### **Unit III**

Rate analysis: Deriving rates for items from labour and material costs based on CPWD Schedule of Rates, scheduled and non-scheduled items, Establishing market rates.



## Unit IV

Specification: -Definition of specifications, objective of writing specifications, essentials of specifications, general and detail specifications of item of work in buildings: Earthwork excavation in foundation, DPC in cement concrete, Brickwork in CM1:6, RCC roof slab, Flooring (Mosaic/vitrified tiles), Plastering and Painting of walls.

## Unit V

Studio exercises related to Quantity Surveying for a small building project using Standard methods and compilation of a Preliminary Estimate.

### References:

1. B. N. Dutta, 'Estimating and Costing in Civil Engineering'; UBS Publishers' Distributors Pvt Ltd, 2016
2. S. C. Rangwala, 'Estimating Costing and Valuation'; Charotar, 2009
3. Robert Peurifoy, Garold Oberlender, 'Estimating Construction Costs'; McGraw-Hill Education, 2013
4. M Chakraborti, 'Estimating, Costing, Specification & Valuation in Civil Engineering'; Chakraborti, 2006
5. D.D. Kohli, R C Kohli, 'A Textbook of Estimating and Costing'; S. Chand, 2013
6. A.K.Upadhyay, 'Civil Estimating & Costing: Including Quality Surveying, Tendering and Valuation'; S K Kataria and Sons, 2013
7. S.P.Mahajan, Sanjay Mahajan, 'Quantity Surveying And Valuation (Estimating,Costing And Contracting)'; Satya Prakashan, 2017
8. National building and other relevant codes

### Course outcomes (COs):

Students will be able to -

1. Estimate the quantity and cost of different components in a building. (PO1, PSO1)
2. Estimate quantities of materials required. (PO1, PSO1)
3. Provide specifications for different construction items. (PO2, PSO2)
4. Analyse rate analysis from first principles for various materials required for civil work. (PO5, PSO1)
5. Apply the acquired knowledge for a given building. (PO5, PSO1)

<b>ARCHITECTURAL STRUCTURES – VI</b>	
<b>Subject Code: AR605</b>	<b>Credits: 3:0:0</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 3 hours/ Week</b>
<b>Course Coordinator: Asst. Prof. M. Vijayanand</b>	

### **Course Objectives:**

To enable the students to -

- Understand the concept of Structural design and detailing of a single storey residential/ commercial building with staircase.
- Learn Drawing & detailing of the Structural elements designed in the residential building
- Get introduced to the concept of high-rise structures
- Get acquainted with various structural systems, structural properties and application of long span structures.

### **Course Contents**

#### **Unit I**

Design of Floor Slabs for Residential Building: Design of One-Way Slab, Two Way slab with corner restraints. Drawing of Slab Reinforcement details for a entire floor plan of a residential/ commercial building.

#### **Unit II**

Staircase: Design & Drawing of the reinforcement details of dog legged staircase for a residential building.

#### **Unit III**

Lintel & Chajja: Design of the Chajjas & Lintels for a residential building. Drawing the reinforcement details for the lintel & chajja for the given plan of residential building.

#### **Unit IV**

Design of High Rise buildings: Evolution of skyscrapers, Basic Design consideration, Structural systems for high-rise, shear walls, Environmental impact, services in skyscrapers, Fire safety, Case Study of skyscrapers in India.

## Unit V

Theoretical and Application of Long Span Structures: Introduction of structural properties and strength, behavior of steel structures.

### Textbooks:

1. Reinforced Concrete design, Second edition - S.Unnikrishna Pillai & Devdas Menon, Tata McGrawhill
2. Limit State Design of Reinforced Concrete, Easter economy Edition-2nd Edition - PC Varghese
3. Design of Reinforced Concrete Structures for Architects - Harbhajan Singh
4. Formwork for Concrete Structures - Kumar Neeraj Jha
5. R.C.C. Design & Drawing - Neelam Sharma

### References:

1. S Unnikrishna Pillai, Devdas Menon, 'Reinforced Concrete Design'; Tata McGraw Hill, 2001
2. Varghese P.C, 'Limit State Design of Reinforced Concrete'; Prentice Hall India Learning Pvt. Ltd, 2008
3. N. Krishna Raju, R. N. Pranesh, 'Reinforced Concrete Design: IS:456-2000 Principles and Practice'; New Age International Pvt Ltd Publishers, 2018
4. David Fanella, 'Reinforced Concrete Structures: Analysis and Design'; McGraw-Hill Education, 2015
5. Ashwani Bedi, Ramsey Dabby, 'Structure for Architects: A Case Study in Steel, Wood, and Reinforced Concrete'; Routledge, 2019

### Course Outcomes (COs):

The students will be able to –

1. Describe and apply limit state design concept in Reinforced concrete elements. (PO1, PSO1)
2. Analyze, design and detailing of varieties of beams, lintels, chajja. (PO2, PSO2)
3. Analyze, design and detailing of slabs and staircase. (PO2, PSO2)
4. Apply principles and concepts of High Rise buildings. (PO2, PSO2)
5. Apply structural principles and concepts of long span structures. (PO2, PSO2)

**Evaluation Pattern:** Marks allocation for SEE (Team Work)

<b>Subject Code</b>	<b>Subject Name</b>	<b>Portfolio</b>	<b>Total</b>
AR605	Architectural Structures VI (SEE Term Work)	50	50

<b>BUILDING SERVICES – IV</b>	
<b>Subject Code: AR606</b>	<b>Credits: 3:0:0</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 3 hours/ Week</b>
<b>Course Coordinator: Prof. Vishwas Hittalmani</b>	

### **Course objectives:**

To enable the students to –

- Achieve proficiency in application of sound control system in design and construction.
- Study modern and prospective materials used in acoustical design.
- Gain practical knowledge of architectural and environmental acoustics as per global requirement.

### **Course contents**

#### **Unit I**

Scope of acoustics, acoustical problem in contemporary architectural design, sound source, path and receiver. Properties of sound, introduction to the study of acoustics – nature of sound, basic terminology- frequency, pitch, tone, sound pressure, sound intensity, decibel scale, loudness, threshold of audibility and pain, masking, sound and distance – inverse square law.

#### **Unit II**

Behaviour of sound in enclosed spaces – reflection of sound, nature of reflection from plane, convex and concave surfaces, sound diffraction, absorption of sound, sound absorption coefficient, reverberation, reverberation time calculation, Sabine's Formula.

#### **Unit III**

Sound absorbents, porous materials, panel or membrane absorbers and cavity or Helmholtz resonators, role of functional absorbers. Absorption coefficients of indigenous acoustical materials.

#### **Unit IV**

Acoustical design requirements for halls used for speech, drama and music. General purpose halls used for speech, music, cinema theatres, home theatres, recording studios and open air theatres.

## Unit V

Introduction to environmental noise control, noise and its classification, outdoor and indoor noise, air borne and structure borne noises. Transmission of noise and transmission loss, STC Rating. Idea of sick-building syndrome. Means of noise control and sound insulations. Constructional measures of noise control and sound insulation. Industrial and urban noise – methods of reduction by enclosures and barriers. Traffic Planning and design against outdoor noise for air traffic, road traffic and rail traffic.

### References:

1. Leslie L. Doelle, 'Environmental Acoustics'; McGraw-Hill, 1972
2. Vern O. Knudsen, Cyril M. Harris, 'Acoustical Designing in Architecture'; Acoustical Society of Amer, 1980
3. Peter Hubert Parkin, H. R. Humphreys, 'Acoustics, Noise and Buildings'; Faber & Faber, 1969
4. Barry Blesser, Linda-Ruth Salter, 'Spaces Speak, Are You Listening? – Experiencing Aural Architecture'; The MIT Press, 2009
5. Tyler Adams, 'Sound Materials: A Compendium of Sound Absorbing Materials for Architecture and Design'; Thames & Hudson, 2016
6. Michael Ermann, 'Architectural Acoustics Illustrated'; Wiley 2015
7. Duncan Templeton, 'Acoustics in the Built Environment'; Architectural Press, 1998
8. T. E. Vigran, 'Building Acoustics'; CRC Press, 2008
9. William J. Cavanaugh, Gregory C. Tocci, Joseph A. Wilkes, 'Architectural Acoustics: Principles and Practices'; Wiley, 2010
10. Codes and standards –
  - National Building Code of India (NBC) 2016; Part 8 Section 4
  - IS 1950: 1962 Code of practice for sound insulation of non-industrial buildings
  - IS 3483: 1965 Code of practice for noise reduction in industrial buildings
  - IS 4954: 1968 Recommendations for noise abatement in town planning
  - IS 11050 (Part 1) 1984: Rating of sound insulation in buildings and of building elements: Part 1 Airborne sound insulation in buildings and of interior building elements
  - IS 11050 (Part 2) 1984: Rating of sound insulation in buildings and of building elements: Part 2 Impact sound insulation
  - IS 2526, 1963: Code of practice for acoustical design of auditoriums and Conference halls

**Course outcomes (COs):**

The students will be able to -

1. Explain the fundamentals of acoustics in building design. (PO1, PSO1)
2. Apply the understanding of sound behaviour in designing enclosed spaces. (PO1, PSO2)
3. Design the acoustics of a space for the desired function with appropriate acoustic materials. (PO3, PSO2)
4. Apply the knowledge of environmental acoustics to design acoustics of outdoor spaces. (PO3, PSO2)
5. Design and execute the acoustic design and detailing in buildings. (PO3, PSO2)

<b>DISASTER MANAGEMENT</b>	
<b>Subject Code: AR607</b>	<b>Credits: 2:0:0</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 2 hours/ Week</b>
<b>Course Coordinator: Prof. Vishwas Hittalmani</b>	

### **Course Objective:**

- To provide awareness about disaster prevention measures in buildings and introduction to building safety from natural hazards and other hazards.

### **Course contents**

#### **Unit I**

Overview and classification of major disasters. Overview of causes, impacts and issues of natural and manmade disasters. Occurrence of disaster in different climatic and geographical regions; Hazard (earthquake and cyclone) map of the world and India. Disaster management cycle, Disaster management plan; National crisis management committee; state management group.

#### **Unit II**

Disaster risk mitigation and climate resilient development for wind and water related disasters- Typhoons, cyclones, floods, Tsunami, storms. Mainstreaming in the special planning process. Behaviour of structures in cyclone/floods/tsunami- case studies. Mitigation, retrofitting methods for cyclones and floods. Planning and design considerations, standards and coastal zoning regulations for storms, cyclones, and floods.

#### **Unit III**

Causes of earthquake - plate tectonics, faults, seismic waves, magnitude, intensity, epicentre, energy release and ground motions. Earthquake effects – liquefaction and landslides. Site planning, building forms, Architectural design concepts for earthquake resistance of buildings.

Case studies on ancient vernacular and traditional regional practices, modern technology, and innovative construction material techniques for earthquake resistance of buildings.



## Unit IV

Seismic retrofitting - Weakness in existing buildings, concepts in repair, restoration and seismic strengthening. Types of Dampers & base isolation methods.

## Unit V

Inter-relationships between urban development, disaster risk and climate change.

Relief shelter design requirements. Design a disaster resilient building or relief shelter for a high-risk zone.

Strategies for disaster prevention and mitigation; Post disaster recovery and rehabilitation (socioeconomic consequences) for any one of the disasters: forest fires, landslides, biological disasters- case study

### References:

1. Editor: David E. Alexander, 'International Journal of Disaster Risk Reduction';Elsevier
2. M. M. Sulphey, 'Disaster Management'; PHI Learning, 2017
3. Mentor Lljunji, 'Seismic architecture: The architecture of earthquake resistant structures'; MSPROJECT, 2016
4. Belen Garcia, 'Earthquake Architecture: New Construction Techniques for Earthquake Disaster Prevention'; HarperCollins, 2000
5. Mariana R. Correia, Paulo B. Lourenco, Humberto Varum, 'Seismic Retrofitting: Learning from Vernacular Architecture'; CRC Press, 2015
6. Schodek Daniel L., Bechthold Martin, 'Structures', Prentice Hall India Learning Pvt. Ltd., 2009
7. Pankaj Agarwal, Manish Shrikhande, 'Earthquake Resistant Design of Structures';PHI, 2011
8. Vinod Hosur, 'Earthquake-Resistant Design of Building Structures'; Wiley, 2013
9. C. V. R. Murty, 'Learning Earthquake Design and Construction - IITK-BMTPCEarthquake Tips'; Springer, 2005  
IS: 4326- Seismic Detailing of Masonry Buildings.  
IS: 1893-2002, IS: 13920-1993, IS: 456-2000, IS: 800-2007 Seismic Design and Detailing of RC and Steel Structures

**Course Outcomes (COs):**

The students will be able to -

1. Explain the phenomenon of disaster. (PO1, PSO1)
2. Characterise the impact of disasters on buildings. (PO1, PSO1)
3. Execute the mitigation strategies for a disaster and its impact on buildings. (PO2, PSO2)
4. Design buildings implementing the principles of earthquake resistance. Understand the procedure of retrofitting post calamity. (PO2, PSO2)
5. Design a disaster relief shelter or building based on guidelines of disaster resistant and mitigation strategies. (PO4, PSO2)

<b>WORKING DRAWING – I</b>	
<b>Subject Code: AR608</b>	<b>Credits: 0:0:2</b>
<b>Pre requisites: Nil</b>	<b>Contact Hours: 5 hours/ Week</b>
<b>Course Coordinator: Assoc. Prof. Sudha Kumari</b>	

### **Course Objectives:**

To enable the students to -

- Learn the techniques of preparing construction drawings
- Prepare centerline drawings of structural and architectural schemes
- Prepare schedule of openings required the construction project
- Learn the preparation of service drawings for a building project
- Learn to represent and draw the detailed interior drawings

### **Course Contents**

#### **Unit I**

Introduction: Overview of Working Drawings; historical perspective; consultants involved in preparation of working drawings, their role and scope; reading, error checking, problems in working drawings. Plan Approval of a mid-rise structure.

Drafting Conventions: Representation of materials, graphic symbols, line type conventions, grid lines, lettering, color codes, paper sizes, title blocks, office practices, standardization of details. CAD Drawings: Working with layers, blocks, templates, assemblies, libraries, layouts, plot styles, error checking, editing

#### **Unit II**

Project work: Preparation of Architectural Working drawings and details for one of the design projects of medium rise-framed structure, from earlier semester. Drawings to include location map/site plan with setting out plan/markings plan, building and infrastructure service lines. Centerline drawing, foundation and footing drawing.

#### **Unit III**

Working drawings of plans at all levels Basement or cellar/Ground/First/Second floor plans. Roof/terrace plan with staircase block cover indicate ridge line, rainwater gradient, etc. for flat roof; indicate ridges, eaves, valley, hips, coping, flashing, skating etc., for pitched roof. Preparation of Doors/windows schedule

#### **Unit IV**

Front/ Back/ side Elevations (N/S/E/W or Orientation wise). Longitudinal & cross section through staircase & lift shaft.

Detail of external/ internal wall section from foundation footing to coping/ ridge showing all necessary elements.

## **Unit V**

Detailed drawings of staircase – Plan, sectional elevation with elements as handrail, balusters, steps & finishes etc. Other miscellaneous items such as ladder, spiral stair, ramp etc. if any.

Detailed drawings for toilet and kitchen if any showing layout plan, elevations & sections, details as necessary.

Detailed drawings of door, window, railing, gate, sky-light, etc.

Schedule of openings External Gate - Elevation, 2 sections (Horizontal & Vertical) and blowup details. Main Door - Elevation, sections, and Details. Internal Door - Elevation, sections, and construction details. Windows/Ventilators - Elevation, sections, and blowup details showing sill, lintel, chajja & shading devices etc. Arch and skylight details.

### **References:**

1. Fred A. Stitt, 'Working Drawing Manual'; McGraw-Hill Education, 1998
2. George T. Clayton, 'Site Plan in Architectural Working Drawings'; Stipes Publishing Llc., 1973
3. Donald Watson, Michael Crosbie, 'Time-Saver Standards for Architectural Design'; McGraw Hill Education, 2017
4. Keith Styles, Andrew Bichard, 'Working Drawings Handbook'; Taylor and Francis
5. Edward Muller, Philip Grau III, 'Reading Architectural Working Drawings: Residential and Light Construction'; Pearson, 2003
6. William J. O'Connell, 'Graphic Communications in Architecture: Standard Format for Architectural Working Drawings'; Stipes Publishing, 1985
7. Rosemary Kilmer, W. Otie Kilmer, 'Construction Drawings and Details for Interiors'; John Wiley & Sons, 2016

### Course Outcomes (COs):

Students will be able to -

1. Understand procedure of plan approval for mid-rise structure; signs and conventions used in preparing working drawing (PO: 1; PSO: 1)
2. Identify basic structural requirements of a building and provide the centerline and foundation drawings for the same (PO: 1; PSO: 1)
3. Prepare working drawing plans of all levels and schedule of openings that are good to be issued to site for construction. (PO: 1; PSO: 1)
4. Prepare working drawings of sections and elevations that are good to be issued to site for construction. (PO: 1; PSO: 1)
5. Prepare working drawings of toilets, kitchen, staircase and develop innovative construction details that are good to be issued to site for construction. (PO: 1; PSO: 1)

**Evaluation Pattern:** Marks allocation for SEE

Subject Code	Subject Name	Portfolio	Viva	Total
AR608	Working Drawing I (SEE Viva Voce)	40	10	50