



RAMAIAH
Institute of Technology

CURRICULUM

Outcome Based Education
(Effective from the Academic Year 2026-2027)

SCHOOL OF ARCHITECTURE

I-IV Semester M. Arch (Advanced Architecture)

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 18 UG programs and 13 PG programs. All these programs are approved by AICTE. All eligible UG and PG programs are accredited by the 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 in the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. The institute has 380 competent faculties out of which 70% 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.

The Entrepreneurship Development Cell (EDC) and Section 8 company "Ramaiah Evolute" have been set up on campus to incubate startups. 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 75th rank among 1584 top Engineering Institutions & 31st Rank for School of Architecture in India among 131 Architecture Institutions, for the year 2025.

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 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 mold 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

RIT shall meet the global socio-economic needs through

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

QUALITY POLICY

We at 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 stakeholders concerned.

VISION OF THE DEPARTMENT

To be a leading center of architectural education and innovation, addressing global challenges through interdisciplinary research cultivating visionary designers who shape resilient, inclusive, and sustainable environments for societal wellbeing.

MISSION OF THE DEPARTMENT

- The school's commitment is to prepare competent architects trained for design excellence and modern technological knowledge through a competitive teaching learning process.
- To provide 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.
- To inculcate a strong sense of social responsibility by developing sustainable design solutions to meet the changing and create innovative designs and technologies.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO1: Graduates will demonstrate advanced architectural knowledge and professional competence in developing innovative, sustainable, and context-responsive design solutions using interdisciplinary approaches and emerging technologies.

PEO2: Graduates will engage in research, critical inquiry, and innovative practices in architecture and allied fields, contributing to academic, professional, and societal advancement through continuous learning.

PEO3: Graduates will practice architecture with professional ethics, environmental responsibility, effective communication, and leadership skills to address contemporary challenges in the built environment.

PROGRAM OUTCOMES (POs):

Programme Outcomes (POs)

PO1: Develop advanced research aptitude and critical analytical skills to address complex architectural, environmental, and urban challenges.

PO2: Demonstrate effective communication, representation, and documentation skills through technical drawings, digital media, research writing, and professional presentations.

PO3: Apply specialized knowledge and interdisciplinary approaches in advanced architecture to create innovative, sustainable, and context-responsive design solutions.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Ability to synthesize architectural theory, technology, structure, environment, and user needs into comprehensive advanced design solutions.

PSO2: Apply digital tools, computational methods, parametric techniques, and emerging technologies in architectural design and research processes.

PSO3: Develop environmentally responsible and energy-efficient architectural solutions addressing sustainability, climate responsiveness, and resilience.

PSO4: Undertake independent research and innovative explorations that contribute to contemporary architectural knowledge and practice.

PSO5: Demonstrate professional competence, ethical responsibility, leadership, and project management skills in architectural practice and allied disciplines.

BOARD OF STUDIES FOR THE TERM 2026 – 2027

Sl.no	Name	Designation
1	Prof. Dr. Rajshekhar Rao	Chairperson
2	Dr. Anup Naik	VTU Nominee
3	Ar. Vidyadhar S. Wodeyar	External Industry Expert
4	Dr. Rama RS	Academician
5	Dr. Chidambara Swamy	Academician
6	Ar. Prasad G	External Industry Expert
7	Ar. Subbiah T S	Alumni External Industry Expert
8	Prof Dr. Monalisa	Member
9	(Dr.) Surekha Ramineni	Member
10	(Dr.) Meghana Raj	Member
11	Er. (Dr) Vijayanand M	Member
12	(Dr.) Shreesha S Bhatt	Member

SCHOOL OF ARCHITECTURE

TEACHING STAFF

Sl No	Name	Qualification	Designation
1	Prof. Dr. Rajshekhar Rao	M. Arch (Landscape Architecture) PhD.	Professor & HOD
2	Prof. Dr. Monalisa	M. Arch (Architecture), PhD.	Professor
3	(Dr.) Sudha Kumari G	M. Arch (Habitat Design)	Associate Professor
4	(Dr.) Akshata Shagoti	M. Arch (Architectural Design)	Assistant Professor
5	Ar. Ashwini Mani	M. Arch (Advanced Architecture)	Assistant Professor
6	(Dr.) Tejaswi N H	B. Arch, M. Plan., (PhD Arch)	Assistant Professor

ADMINISTRATIVE STAFF

1	Mr. Nagesh B.L	Dip. in Mech. Engg.	Instructor
2	Ms. Swathi	M.com	SDA

SUPPORT STAFF

1	Mr. Ramachandra Chari	Attender
2	Mrs. Parvathy	Attender

RAMAIAH INSTITUTE OF TECHNOLOGY, BANGALORE
(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU, BELGAUM)
SCHEME OF TEACHING & EXAMINATION – I Semester M. ARCH (Advanced Architecture)
ACADEMIC YEAR 2026- 2027

S. No	Course Code	Course Title	Category	Credits				Total Contact hours per week		
				L	T	P	Total	L	T	P
1	2MAAA10	Advanced Architectural Design -I	PC	0	0	9	9	0	0	9
2	2MAAA102	Advanced Building Materials & Construction Technology	PC	0	0	5	5	0	0	5
3	2MAAA 103	Advanced BIM	PS	0	0	3	3	0	0	3
4	2MAAA104	Elective-I	PE	1	0	2	3	1	0	2
	Total			1	0	19	20	1	0	19

Note: PC: Professional Core, PS: Professional Support, PE: Professional Elective
1credit = 1 hour/ week of Lecture (L)
1 Credit = 1 hour/week of Tutorial (T)
1 Credit = 1 hour/ week of practical (P)

	Course Code	Course title	Credits
1.	2MAAA E01	Sustainable Habitat Design	1:0:2
2.	2MAAA E02	Python for Architecture	1:0:2
3	2MAAA E03	Social Theory & Urban Design in Practice	1:0:2

CIE = Continuous Internal Evaluation

SEE = Semester End Examination

Evaluation Pattern: Marks allocation for SEE

Subject Code	Subject	Portfolio	Viva voce	Total
2MAAA10	Advanced Architectural Design Studio-I (SEE Viva voce)	40	10	50

Subject Code	Subject	Portfolio	Report	Total
2MAAA104 / AAE01	Elective-I (Sustainable Habitat Design) (SEE Term work)	40	10	50

Subject Code	Subject	Portfolio	Report	Total
2MAAA104/ AAE02	Elective-I (Python for Architecture) (SEE Term work)	40	10	50

Subject Code	Subject	Portfolio	Report	Total
2MAAA104/ AAE03	Elective-I (Social Theory & Urban Design in Practice) (SEE Term work)	40	10	50

Note:

1. Literature survey will be a requirement for architectural design study. Periodical review by an external jury for subjects going for viva voce.
2. National/International tours may be arranged during vacation for students, to study good examples of Advanced Architecture.
3. For all viva voce examinations one internal faculty and one external faculty will conduct the exam.
4. Portfolios have to be submitted on a prescribed date for all subjects on the date announced by the department.
5. All students have to register on the first day at the beginning of the Viva Voce exam.
6. All students have to register on the first day of Term work exams.

SCHEME OF TEACHING & EXAMINATION – II Semester M. ARCH (Advanced Architecture)
ACADEMIC YEAR 2026- 2027

S. No.	Course Code	Course Title	Category	Credits				Total Contact hours per week		
				L	T	P	Total	L	T	P
1	2MAAA 201	Advanced Architectural Design -II	PC	2	0	7	9	0	0	9
2	2MAAA202	Building Performance Assessment (Simulation Software)	PS	2	0	3	5	0	0	5
3	2MAAA203	Advanced Structural Systems	PC	1	0	2	3	0	0	3
4	2MAAA204	Elective-II	PE	3	0	0	3	1	0	2
	Total			8	0	12	20	1	0	19

Note: PC: Professional Core, PS: Professional Support, PE: Professional Elective
1 credit = 1 hour/ week of Lecture (L)
1 Credit = 1 hour/week of Tutorial (T)
1 Credit = 1 hour/ week of practical (P)

	Course Code	Course title	Credits
1.	2MAAAE04	Net zero buildings	3:0:0
2.	2MAAA E05	Virtual Reality and Augmented Reality in Architecture	3:0:0
3	2MAAA E06	Land use structure & Urban Morphology	3:0:0

CIE = Continuous Internal Evaluation

SEE = Semester End Examination

Evaluation Pattern: Marks allocation for SEE

Subject Code	Subject Name	Portfolio	Viva voce	Total
2MAAA 201	Advanced Architectural Design -II (SEE Viva voce)	40	10	50

Subject Code	Subject	Portfolio	Report	Total
2MAAA202	Building Performance Assessment (Simulation Software) (SEE Term work)	40	10	50

Subject Code	Subject	Portfolio	Report	Total
2MAAA 20/ 2MAAAE04	Elective-II Net zero buildings (SEE Term work)	40	10	50

Subject Code	Subject	Portfolio	Report	Total
2MAAA / 2MAAA E05	Elective-II Virtual Reality and Augmented Reality in Architecture (SEE Term work)	40	10	50

Subject Code	Subject	Portfolio	Report	Total
2MAAA / 2MAAA E06	Elective-II Land use structure & Urban Morphology (SEE Term work)	40	10	50

Note:

1. Literature survey will be a requirement for architectural design study. Periodical review by an external jury for subjects going for viva voce.
2. National/International tours may be arranged during vacation for students, to study good examples of Advanced Architecture.
3. For all viva voce examinations one internal faculty and one external faculty will conduct the exam.
4. Portfolios have to be submitted on a prescribed date for all subjects on the date announced by the department.
5. All students have to register on the first day at the beginning of the Viva Voce exam.
6. All students have to register on the first day of Term work exams.

SCHEME OF TEACHING & EXAMINATION – III Semester M. ARCH (Advanced Architecture)
ACADEMIC YEAR 2026- 2027

S. No	Course Code	Course Title	Category	Credits				Total Contact hours per week		
				L	T	P	Total	L	T	P
1	2MAAA 301	Thesis Project	PC	0	0	12	12	0	0	12
2	2MAAA302	Advanced Building Systems Integration	PS	0	0	3	3	0	0	3
3	2MAAA303	Project Management	PC	1	0	1	2	1	0	1
4	2MAAA304	Elective-III	PE	3	0	0	3	3	0	0
	Total			4	0	16	20	4	0	16
Note: PC: Professional Core, PS: Professional Support, PE: Professional Elective 1credit = 1 hour/ week of Lecture (L) 1 Credit = 1 hour/week of Tutorial (T) 1 Credit = 1 hour/ week of practical (P)										
	Course Code	Course title								Credits
1.	2MAAA E07	Impact Assessment of Environment								3:0:0
2.	2MAAA E08	Prompt Engineering and Generative AI for Architecture Design								3:0:0
3	2MAAA E09	Advanced Theory of Design: Architecture and Human Settlements								3:0:0

CIE = Continuous Internal Evaluation

SEE = Semester End Examination

Evaluation Pattern: Marks allocation for SEE

Subject Code	Subject	Portfolio	Viva voce	Total
2MAAA 301	Thesis Project SEE (Viva Voce)	40	10	50

Subject Code	Subject	Portfolio	Report	Total
2MAAA302	Advanced Building Systems Integration SEE (Term Work)	40	10	50

Subject Code	Subject	Portfolio	Report	Total
2MAAA304/ 2MAAA E07	Elective-III Impact Assessment of Environment SEE (Term Work)	40	10	50

Subject Code	Subject	Portfolio	Report	Total
2MAAA304/ 2MAAAE08	Elective -III Prompt Engineering and Generative AI for Architecture Design SEE (Term Work)	40	10	50

Subject Code	Subject	Portfolio	Report	Total
2MAAA304 / 2MAAAE09	Elective-III Advanced Theory of Design: Architecture and Human Settlements SEE (Term Work)	40	10	50

Note:

1. Literature survey will be a requirement for architectural design study. Periodical review by an external jury for subjects going for viva voce.
2. National/International tours may be arranged during vacation for students, to study good examples of Advanced Architecture.
3. For all viva voce examinations one internal faculty and one external faculty will conduct the exam.
4. Portfolios have to be submitted on a prescribed date for all subjects on the date announced by the department.
5. All students have to register on the first day at the beginning of the Viva Voce exam.
6. All students have to register on the first day of Term work exams.

**SCHEME OF TEACHING & EXAMINATION – IV Semester M. ARCH (Advanced Architecture)
ACADEMIC YEAR 2026- 2027**

S. No.	Course Code	Course Title	Category	Credits				Total Contact hours per week		
				L	T	P	Total	L	T	P
1	AA 401	Thesis Project	PC	0	0	20	20	0	0	20
	Total			0	0	20	20	0	0	20
Note: PC: Professional Core, PS: Professional Support, PE: Professional Elective 1credit = 1 hour/ week of Lecture (L) 1 Credit = 1 hour/week of Tutorial (T) 1 Credit = 1 hour/ week of practical (P)										

CIE = Continuous Internal Evaluation

SEE = Semester End Examination

Evaluation Pattern: Marks allocation for SEE

Subject Code	Subject Name	Portfolio	Viva Voce	Total
2MAAA 401	Practical Training (SEE Viva Voce)	40	10	50

Note:

1. Literature survey will be a requirement for architectural design study. Periodical review by an external jury for subjects going for viva voce.
2. National/International tours may be arranged during vacation for students, to study good examples of Advanced Architecture.
3. For all viva voce examinations one internal faculty and one external faculty will conduct the exam.
4. Portfolios have to be submitted on a prescribed date for all subjects on the date announced by the department.
5. All students have to register on the first day at the beginning of the Viva Voce exam.
6. All students have to register on the first day of Term work exams.

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Outcome Based Education
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I Semester M. Arch (Advanced Architecture)

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SEMESTER - I

Advanced Architectural Design -I	
Course Code: 2MAAA101	Credits: 0 :0: 9
Prerequisite: Nil	Contact Hours: 9 Hrs./ Wk.
Course Coordinator: Ar Sudha Kumari G	

Course Objectives

- To introduce the students to complexities of advanced architectural design.
- To enable skills for designing advanced architectural projects with sustainable strategies.
- To enable students to employ advanced BIM for developing complex architectural drawings.

Course Contents

Unit I

Understand the basics of advanced architecture: Introduction to small projects; To conceptualize and design a pavilion that embodies the principles of net-zero energy and sustainable architecture, serving as a demonstration space for future-forward, climate-conscious design solutions. The pavilion should be designed as an engaging, functional space for public use, exhibitions, or small gatherings. Generate concepts related to net zero building, that is designed, constructed, and operated to produce as much renewable energy on-site (or through clean energy sources) as it consumes over the course of a year, thereby achieving a net balance of zero energy consumption and minimizing carbon emissions.

Unit II

Introduction to Tall Buildings and High rise development, Typologies of High-rise buildings based on their structural systems, functional use, and construction materials, particularly- Mixed use development; Indian Standards, Codes, guidelines, and regulations related to High rise development. Documentation and Case Study: Identification of a literature Case Study and an observational Case-study (preferably local), and Documentation of plan layouts and master plans. Detailed drawings focusing on integrating complexities of various layers of the high rise development, Focus on sustainable design elements in architecture.

Unit III

Site selection, site analysis, and concept formulation are interconnected stages that form the foundation of the design process. Site selection refers to identifying and choosing the most suitable location for a project, based on factors such as accessibility, topography, climate, infrastructure, and legal or cultural considerations. The insights gained from site analysis guide the next stage—concept formulation—which involves developing an overarching design idea or vision that integrates user needs, site characteristics, and contextual influences into a coherent design strategy.

Unit IV

Drawing Development: Architectural drawings including - Master Plan, Site Plan, Floor Plans, Elevations and Sections and services. Aspects to be addressed can include: Sustainable building practices, Intelligent building materials and techniques, Service integration, and Advanced building practices.

Unit V

Drawings and Renders: Architectural Drawings and 3 D renders highlighting - Circulation system integration, Logistic chain and Structural design and Building Services using advanced BIM.

Course Outcomes (COs):

The student will be able to

CO1: Develop the ability to understand and analyse complex architectural designs parameters and the development regulations governing it.

CO2: Develop spatial programs for advanced architectural projects through literature reviews, field studies, and case studies.

CO3: Analyse and Apply methods of integrating- services, structure, and sustainable strategies into high rise architectural designs.

CO4: Apply and integrate understandings of high rose buildings to create architectural designs and develop architectural drawings.

CO5: Integrate knowledge of interdisciplinary subjects to develop detailed drawings, 3-D renders, models for given the design project.

References:

1. Tall Buildings and Vertical Urbanism is authored by A.K. Jain
2. Tall: The Design and Construction of High-Rise Architecture by Guy Marriage
3. Sustainable Buildings and Construction for India: Policies, Practices and Performance by TERI & UNEP
4. Designing Tall buildings by Mark Sarkisian
5. Structural Analysis and Designing of Tall building, Bungale S Taranath
6. Introduction to Architecture Technology by William McLean, Peter silver and Dason Whitsett
7. Industrial Architecture (Building Big)-Joyce M
8. Green Walls in High-Rise Buildings by Payam Bahrami and Antony Wood
9. Sustainable Design of Eco-Friendly Skyscraper for the Modern Society by Dr. Vinima Gambhir et al.

Evaluation Pattern: Marks allocation for SEE Viva Voce:

Subject Code	Subject	Portfolio	Viva voce	Total
2MAAA101	Advanced Architectural Design-I (SEE Viva Voce)	40	10	50

SEMESTER - I

Advanced Building Materials & Construction Technology	
Course Code: 2MAAA102	Credits: 0 :0: 5
Prerequisite: Nil	Contact Hours: 5 Hrs./ Wk.
Course Coordinator: Ar Akshata Shagoti	

Course Objectives:

1. To introduce students to structural systems and design principles essential for tall building construction.
2. To familiarize students with advanced materials and technologies, including high-performance concrete and composite systems, facade systems and building envelopes used in high-rise buildings.
3. To educate students on the integration of building services and fire protection systems to ensure safety and functionality in tall structures.

Course Contents

Unit-I

Introduction to Tall Structures and Design Principles – Overview of tall building structures and their classification. Introduction to major structural systems such as shear frames, interacting systems, partial and fully tubular systems. Floor systems in tall buildings with emphasis on composite steel, prestressed, and post-tensioned concrete systems. Foundation systems for tall buildings, including raft, pile, and caisson foundations, with basic design considerations.

Unit-II

Steel Structural Systems in Tall Structures – Structural strategies to resist wind and seismic forces using advanced steel configurations. Steel braced frames and moment-resisting frames with examples of cyclic behavior and high-rise applications. Steel shear wall and core-outrigger systems with benefits and limitations in supertall constructability. Steel tubular systems (framed, tube-in-tube, bundled tube) and diagrid systems, highlighting structural efficiency, material optimization, and architectural expression. Brief introduction to hybrid steel systems combining multiple approaches for enhanced performance.

Unit-III

High-Performance concrete in Tall building applications - Properties and applications of high-performance concrete (HPC) in tall building construction. Study of Ultra-high-strength, self-consolidating, and durable concrete types, with emphasis on their structural and workability advantages. The unit also introduces fibre-reinforced and lightweight concrete for use in key structural elements like core walls and slabs. Concrete admixtures and curing methods.

Unit-IV

Façade Systems and Building Envelopes in Tall Structures – Introduction to façade and building envelope systems. Classification of façade systems: curtain walls, structural glazing, double-skin façades, and unitized panel systems. Thermal and acoustic performance requirements, with emphasis on energy efficiency, daylighting, and climate-responsive design. Integration of high-performance glazing, shading devices, and advanced materials such as ETFE ((Ethylene Tetrafluoroethylene) and photovoltaic façades. Structural considerations for wind loads, thermal

movement, and seismic behavior of façades. Fire-resistant cladding strategies, waterproofing, and durability. Examples.

Unit-V

Building Services and Fire Safety in Tall Structures- Integrated building services and fire safety systems in tall buildings, ensuring functional efficiency and occupant safety. Classification of vertical transportation systems, sky lobbies, and service floors. Introduces high-rise water supply strategies. Integration of electrical and energy conservation methods. Fire protection systems, through the design and layout of wet risers, fire sump tanks, automatic sprinklers, smoke detectors, and alarm systems, evacuation planning through fire escape stairs, fire-rated doors, and the use of fire-resistant materials.

Course Outcomes (COs):

The student will be able to

CO1 – To understand the fundamentals of tall structures, structural systems, floor systems, and foundation systems used in high-rise buildings.

CO2 – To analyze steel structural systems and advanced lateral load-resisting systems adopted in tall structures.

CO3 – To understand the properties, applications, and performance of high-performance concrete and advanced concrete technologies in tall buildings.

CO4 – To study façade systems, building envelopes, and their structural, thermal, acoustic, and energy-performance requirements in tall structures.

CO5 – To understand integrated building services, vertical transportation, fire safety systems, and occupant safety measures in tall buildings.

References:

1. Barry's Advanced Construction of Buildings by Stephen Emmitt and Christopher A. Gorse
2. Bennett, Ian et al- Tall Building Structural Systems.
3. Proceedings of the Council for Tall Buildings- Vol 1 to 10.
4. Structural Steel Design: A Practice-Oriented Approach by Wang, C., & Salmon, C. (2014)
5. Steel Design by William T. Segui (2018)
6. Design of Steel Structures by Edwin H. Gaylord, Charles N. Gaylord, and James E. Stallmeyer (2011)
- +Fiber-Reinforced Polymers: A Review by Muhammad Rizwan, et al. (2018)
7. Design of Reinforced Concrete Structures with Fiber Reinforced Polymers (FRP) by Mohamed M. K. (2017)
8. Structural Steel Design: A Practice-Oriented Approach by Wang, C., & Salmon, C. (2014)
9. Design of Steel Structures by Edwin H. Gaylord, Charles N. Gaylord, and James E. Stallmeyer (2011)
10. Composite Materials for Construction: Structural Design with FRP by Alain S. (2019)

SEMESTER - I

Advanced BIM	
Course Code: 2MAAA103	Credits 0 : 0 : 3
Prerequisite: Nil	Contact Hours: 3 Hrs./ Wk.
Course Coordinator: Prof. Dr. Rajshekhar Rao	

Course Objectives:

- To equip students to comprehend the principles, concepts, and terminology of BIM & recognize the importance of BIM in the construction industry.
- To enable students to Create and manage 3D digital models using BIM software.
- To teach students to utilize BIM as a communication tool to resolve design conflicts.

Course contents

Unit I

Overview of BIM Concepts: Definition, history, and evolution of BIM in the AEC industry, Types of files, introduction to user interface

Unit II

Setting up BIM Project: Setting up the project file, Navigation and viewing techniques, Modeling of Architectural elements, modify and manage settings.

Unit III

Design Process in BIM: Creating 2D elements, adding annotations, Advance modeling techniques and massing, Content creation.

Unit IV

Annotations and Visualization: Rendering settings, applying materials and export options. Create and manage sheets. Tools for project collaborations and documentation.

Unit V

Design output: Setting site topography and linking of files.

Create sample projects for a residential or commercial building and produce standard working drawing and rendered views.

Course Outcomes (COs):

The student will be able to

CO1- To understand the basic principles and key terminology of Building Information Modeling.

CO2- To gain hands-on experience with BIM tools and software for creating and managing digital models.

CO3- To work on conceptual models, create custom contents into the project and explore the complex modeling techniques.

CO4- To use BIM tools for presentations, collaborations and documentation.

CO5- To apply and demonstrate a sample BIM project with modeling, documentation and visualization skills.

References:

1. Introduction to Architecture Technology by William McLean, Peter silver and Dason Whitsett
2. BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers- Chuck Eastman, Paul Teicholz, Rafael Sacks, & Kathleen Liston
3. BIM and Construction Management: Proven Tools, Methods, and Workflows - Brad Hardin & Dave McCool
4. Green BIM: Successful Sustainable Design with Building Information Modeling - Eddy Krygiel & Bradley Nies
5. A Designer's Guide to Building Information Modeling: A Practical Overview for Design Professionals- Calvin Luebke & David Briscoe
6. Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations- Philip G. Bernstein & James H. Pittman
7. BIM in Small-Scale Sustainable Design Projects- Michael Uhm & Seungbae Lee
8. Design Integration Using Autodesk Revit 2024- Authors: Daniel John Stine & Aaron Hansen
9. The BIM Manager's Handbook: Guidance for Professionals in Architecture, Engineering, and Construction - Dominic Holzer.

SEMESTER – I

Elective I (Sustainable Habitat Design)	
Course code: 2MAAA104/ 2MAAAE01	Credits: 1:0:2
Pre-requisite: Nil	Contact Hours: 3 Hrs./ Wk.
Course Coordinator: Ar. Sudha Kumari G	

Course objectives

- To equip students with the knowledge and skills to design and plan urban built environments and habitat, while promoting the well-being of their inhabitants.
- The course will focus on the integration of sustainability principles in architecture, urban design, and the growing demand for livable spaces.

Unit I

Understanding Cities and Sustainable Development: Reading the city in relation to social structure, cognition, lived experience, and urban form; Concept and principles of Sustainable; Development: environmental protection, social equity, and economic viability in urban contexts; Introduction to socio-spatial relationships and urban morphology with emphasis on sustainability, environmental performance, and inclusive development.

Unit II

Habitat, Built Environment, and Sustainability: Habitat design in relation to planning and architecture.; Principles of sustainable habitat development, including resource efficiency, climate responsiveness, and human well-being.; Habitat design as an extension of architecture and planning, focusing on sustainable settlement patterns.

Unit III

Evolution of Urban Thought and Sustainability: Evolution of urban form and settlement concepts across cultures and in India; Utopian and reformist ideas in urban planning and development.; Changing paradigms of sustainability, climate adaptation, and resilience in urban planning and design practices.

Unit IV

Urban Analysis for Sustainable Development: Basic approaches to urban analysis and surveys; Concepts of imageability, townscape, and perception of urban environments (Kevin Lynch, Gordon Cullen) as tools to assess environmental quality, livability, and social inclusiveness; Selected contemporary examples illustrating sustainable urban development practices

Unit V

Contemporary Urban Challenges and Sustainable Futures: Emerging social, environmental, and community-related issues in urban areas; Sustainable development strategies at multiple scales: neighborhoods, campuses, city centers, transport corridors, and waterfronts; Emphasis on climate resilience, inclusive public spaces, low-carbon development, and community participation.

Course Outcomes (COs):

The student will be able to

CO1: Students will be able to explain and interpret the concept of sustainable development in urban contexts by relating social structure, spatial form, and lived experience of cities to environmental, social, and economic sustainability.

CO2: Students will be able to analyze habitat and built environment patterns using sustainable development principles, evaluating their implications for resource efficiency, climate responsiveness, and human well-being.

CO3: Students will be able to critically assess the evolution of urban and settlement concepts across cultures and in India, and relate utopian ideas to contemporary sustainability and climate adaptation challenges.

CO4: Students will be able to apply basic urban analysis to evaluate environmental quality, livability, and inclusiveness of urban areas in the context of sustainable development.

CO5: Students will be able to formulate sustainable development strategies for addressing contemporary urban social, environmental, and community issues across multiple spatial scales with emphasis on resilience and inclusivity.

Reference books:

1. Kevin Lynch- Imageability of City
2. Camillo Sitte -City Planning according to Artistic principles
3. Kevin Lynch -Good City Form
4. Rob Krier -Urban street and Squares
5. Gordon Cullen -Townscapes
6. Time-Savers Standards for Urban Design.

Evaluation Pattern: Marks allocation for SEE Viva Voce:

Subject Code	Subject	Portfolio	Report	Total
2MAAA104/ 2MAAAE01	Elective-I Sustainable Habitat Design (SEE Term work)	40	10	50

SEMESTER – I

Elective I (Python for Architecture)	
Course code: 2MAAA104/ 2MAAAE02	Credits: 1:0:2
Pre-requisite: Basic Python, Fundamentals of Architecture/Urban Studies	Contact Hours: 3 Hrs./ Wk.
Course Coordinator: Prof. Dr. Rajshekhar Rao	

Course objectives:

- Apply Python-based machine learning techniques to analyze architectural and urban datasets for applications in design research, planning, and environmental simulation.
- Utilize Natural Language Processing (NLP) tools, particularly NLTK, to extract, interpret, and classify semantic information from architectural texts, policies, and research documents.
- Design and implement data-driven workflows using regression, classification, soft computing models (ANN, CNN), and decision trees to support informed architectural decision-making.

Course contents

Unit I

Introduction to Python for Architecture & NLTK Basics- Python for design computation and data analysis; Architectural data formats (CSV, JSON, GeoJSON, XML); Introduction to Natural Language Processing (NLP) in architecture; NLTK: Installation, corpora, tokenization, stemming, lemmatization; Parsing architectural texts and extracting design concepts

Unit II

Regression and Classification Models for Architectural Data- Linear Regression and applications in environmental modeling (e.g., daylight, energy use), Logistic Regression in binary classification (e.g., site suitability: suitable/unsuitable), Multiclass Classification: zoning types, building types, heritage classification, Feature scaling and model evaluation (confusion matrix, accuracy, precision)

Unit III

Filtering and Noise Reduction in Architectural Datasets- Introduction to signal filtering in environmental data (e.g., temperature, noise levels); Smoothing techniques: Moving Average, Kalman filter (basic concept); Data cleaning, handling missing values, and outlier detection; Visualization of time-series architectural data

Unit IV

Soft Computing: ANN, CNN, Bias, and Entropy- Introduction to Soft Computing in architecture, Artificial Neural Networks (ANN): Basics and applications in pattern recognition (e.g., spatial layouts), Convolutional Neural Networks (CNN): Basics and use in image-based analysis (e.g., facade classification), Bias-Variance Tradeoff, Information Theory concepts: Entropy and its use in architectural decision systems

Unit V

Decision Trees and Random Forests in urban planning and policy modeling; Rule-based classification and interpretable models; Integration of NLTK with Decision Trees (text-based

classification); Capstone Project: Defining a research question and applying a suitable ML pipeline

Course outcomes (COs):

The student will be able to

CO1: Process and analyze architectural data using Python, including handling textual, numerical, and visual data formats relevant to design and planning.

CO2: Apply regression and classification algorithms to solve architectural problems such as energy modeling, site analysis, and zoning classification.

CO3: Clean, filter, and smooth noisy datasets from environmental and urban sources for accurate interpretation and predictive modeling.

CO4: Implement soft computing techniques such as Artificial Neural Networks (ANN) and Convolutional Neural Networks (CNN) to analyze architectural patterns and design-related image data.

CO5: Integrate Natural Language Processing (NLP) using NLTK with decision tree models to perform semantic classification and interpretation of architectural texts, research documents, and policy data.

References:

1. *Python Machine Learning* by Sebastian Raschka
Natural Language Processing with Python by Steven Bird, Ewan Klein, and Edward Loper (NLTK Book)
2. *Deep Learning with Python* by François Chollet
3. Tools/Libraries:
4. Python (Jupyter Notebooks)
5. NLTK
6. Scikit-learn
7. Pandas, NumPy, Matplotlib, Seaborn
8. TensorFlow/Keras
9. OpenCV (optional for image data)

Evaluation Pattern: Marks allocation for SEE Viva Voce:

Subject Code	Subject	Portfolio	Report	Total
2MAAA104/ 2MAAAE02	Elective-I Python for Architecture (SEE Term work)	40	10	50

SEMESTER – I

Elective I (Social Theory & Urban Design in Practice)	
Course code: 2MAAA104/ 2MAAAE03	Credits: 1:0:2
Pre-requisite: Nil	Contact Hours: 3 Hrs./ Wk.
Course Coordinator: Dr Monalisa	

Course objectives:

- To introduce students to key classical and contemporary social theories for understanding urban form and urban society.
- To develop a critical understanding of the city as a socio-spatial construct shaped by social, cultural, and economic forces.
- To enable students to interpret urban form, architectural typologies, and materiality in relation to social processes through field-based analysis.

Course contents

Unit I

Classical Theoretical Perspectives –Karl Marx (capitalism and class); Friedrich Engels (urban working-class conditions); Ferdinand Tönnies (community and association); Émile Durkheim (social solidarity); Georg Simmel (urban experience and social distance); Max Weber (social structure of the city and urban community).

Unit II

Contemporary Theoretical Perspectives I – Robert Park: human ecology; interaction of population, culture, technology, and environment; processes shaping urban social organization.

Unit III

Contemporary Theoretical Perspectives II –Ecology and human ecology (comparative overview); Louis Wirth (urbanism as a way of life); Ernest Burgess (concentric zone theory); Homer Hoyt (sector theory); Harris and Ullman (multiple nuclei theory).

Unit IV

Applied Urban Theory – Local City Context (Exercise Based) –Interpretation of concepts such as class structure, community, social solidarity, urban experience, and spatial organization in relation to architectural typologies and built form. Exercises include mapping of building types, documentation of materiality and spatial configuration, analytical sketches, photographs, and brief written interpretations linking social theory with architectural expression.

Unit V

Neighborhood-level field studies focusing on architectural typologies and the materiality of the built form and their relationship to social life and everyday practices; The unit examines building types, construction materials, density, land use patterns, and public spaces to understand their influence on social interactions, community behavior, and spatial inclusivity. Exercises include guided urban walks, documentation and analysis of built form and materials, mapping of

socio-spatial relationships, and interpretative studies linking architectural expression to social dynamics.

Course Outcomes (COs):

The student will be able to

CO1: To understand the evolution of urban form in the global context.

CO2: To enable understanding a city through political, economic, social, and cultural lenses.

CO3: To analyze a city and its underlying forces through various social theories.

CO4: To analyze the ability of a city in terms of its people, community & identity.

CO5: To understand a city through a public lens.

References:

1. The City Cultures Reader – Edited by Iain Borden, Tim Hall, and Malcolm Miles. Published by Routledge, 2003.
2. City, Class, and Power (Sociology, Politics & Cities) – By Manuel Castells. Published by Palgrave Macmillan, 1978.
3. City of Quartz: Excavating the Future in Los Angeles – By Mike Davis. Published by Verso, 1990.
4. Spaces of Capital: Towards a Critical Geography – By David Harvey. Published by Blackwell/Wiley, 2001.
5. Spaces of Hope – By David Harvey. Published by the University of California Press, 2000.
6. The Death and Life of Great American Cities – By Jane Jacobs. Published by Vintage, 1961.
7. The Urban Sociology Reader – Edited by Jan Lin and Christopher Mele. Published by Routledge, 2012.

Evaluation Pattern: Marks allocation for SEE Viva Voce:

Subject Code	Subject	Portfolio	Report	Total
2MAAA104/ 2MAAAE03	Elective-I Social Theory & Urban Design in Practice (SEE Term work)	40	10	50

CURRICULUM

Outcome Based Education
(Effective from the Academic Year 2026-2027)

SCHOOL OF ARCHITECTURE

II Semester M. Arch (Advanced Architecture)

RAMAIAH INSTITUTE OF TECHNOLOGY

(Autonomous Institute, Affiliated to VTU)

Bangalore -560054

SEMESTER – II

Advanced Architectural Design -II	
Course code: 2MAAA 201	Credits: 2:0:7
Pre-requisite: Nil	Contact Hours: 09 Hrs./ Wk.
Course Coordinator: Prof. Dr Monalisa	

Course objectives:

- To demonstrate the student's capability of synthesizing architecture, engineering systems, and social sciences through a capstone project that
- To showcase creative and critical thinking abilities and skills developed through the course.

Course contents

Unit I

Understanding the design of public infrastructure such as airport, metro, bus terminals, pavilions, convention centres; site details and analysis, zoning, site plan, entry/exit, parking, pickup, drop off, Service entry/exit, service parking, loading/unloading. Building bye-laws, norms, fire and safety regulations, design standards guidelines, and regulations needed for industrial infrastructure.

Unit II

Documentation and case study, the conceptual drawings to be taken up for design and detailing either as individual blocks or as a whole, supported with working models. Drawings will be detailed as plans, sections and elevations, and 3D representations to demonstrate the total project.

Unit III

Concept and Design: Site study and analysis, Formulation of the spatial program, concept sketches for service layout and materials study required for the Architectural Design project. Design aspects can include- sustainable building practices, intelligent building techniques and advanced building practices, and appropriate materials and construction.

Unit IV

Architectural Drawings: Master Plan, Floor plans, Sections and Elevations, services, landscape details and integration with structures.

Unit V

Models and Renders: 3-D renders or models using BIM or advanced tools. Students can explore 3d printing for model making.

Course Outcomes (COs):

The student will be able to

CO1: Ability to independently handle an Architectural Design Project, research the requirements of a project, prepare a brief, try alternative approaches/ concepts, and evaluate them on a way to make a final comprehensive proposition.

CO2: Develop an architectural design for built forms and unbuilt spaces, understanding of how to choose appropriate tools and techniques to inform sustainable and environmental design principles in design.

CO3: Apply and integrate the learning of detailing space, space planning principles in logistic infrastructure designing to develop a master plan.

CO4: Integrate circulation, services, and structural aspects in design and evolve interior details.

CO5: To Learn new concepts, develop skills, Gain new perspectives, and networking through attending workshops on industrial infrastructure and sustainable design.

References:

1. "Public Transportation and Urban Development" by Cervero, and selected case studies.
2. "Architecture of Transport" by J.P. Zukowsky
3. "Transit Oriented Development" by Robert Cervero
4. "Designing Urban Transformation" by Aseem Inam
5. Selected academic papers on transport and urban mobility (provided throughout the course).

Evaluation Pattern: Marks allocation for SEE Viva Voce:

Subject Code	Subject Name	Portfolio	Viva voce	Total
2MAAA 201	Advanced Architectural Design -II (SEE Viva voce)	40	10	50

SEMESTER – II

Building Performance Assessment (Simulation Software)	
Course code: 2MAAA 202	Credits: 2:0:3
Pre-requisite: Nil	Contact Hours: 5 Hrs./ Wk.
Course Coordinator: Ar. Akshata Shagoti	

Course objectives:

- To develop the necessary theoretical knowledge and practical skills to effectively apply building performance assessment tools in design, analysis, and research contexts.
- Emphasis is placed upon simulating the building's thermal performance to make it more sustainable.

Course contents

Unit I

Introduction to elements of building performance assessment using concept of dynamic thermal and building system simulations, which are used to predict energy use and reduce energy demand and carbon emissions in sustainable building design. Basic principles for designing effective ventilation systems; solar radiation influences heating, cooling.

Unit II

Introduction to Energy Modelling Software through digital tools used for building performance assessment, energy modelling, daylight analysis, and thermal comfort studies in sustainable architectural design. Study of Climate Consultant for climate analysis and passive design strategies; Autodesk Revit with Green Building Studio for BIM-integrated energy analysis; OpenStudio for advanced energy simulation and parametric studies; and IES Virtual Environment (IESVE) for thermal, daylight, solar, and HVAC performance analysis. Application of building performance analysis tools in evaluating energy efficiency and sustainable building design.

Unit III

Introduction to Daylighting and Solar Analysis Tools on how to test building orientation, window size and placement, and shading devices during early design stages. Visual outputs and performance feedback for improving daylight quality, reducing energy use, and increasing visual comfort using tools used to study daylight and solar performance in buildings.

Unit IV

Introduction to Thermal Comfort Analysis Tools on to- how to assess indoor conditions such as temperature, humidity, air movement, and heat radiation. The unit introduces tools ranging from simple, user-friendly software for early design decisions to advanced simulation systems that model airflow and heat transfer in detail.

Unit V

Case study: study of two well-known buildings where design decisions were guided by performance simulations. Students will examine how energy, daylight, and thermal analysis influenced the final design and how simulation tools were used to improve building performance and sustainability outcomes.

Course Outcomes (COs):

The student will be able to

CO1: Understand and explain key building performance parameters such as thermal behavior, solar radiation, daylighting, and natural ventilation.

CO2: Identify and compare major building energy modelling tools used in architectural practice.

CO3: Understand the principles of daylighting and solar analysis in architectural design

CO4: Apply thermal comfort analysis to support energy-efficient and user-centered design decisions

CO5: Synthesize simulation outcomes with architectural design strategies in precedent studies.

References:

1. Energy Plus Documentation, U.S. Department of Energy.
2. URL: Energy Plus Documentation
3. Crawley, D.B., et al. (2001). Energy Plus: Energy Simulation Program. ASHRAE Transactions, 107(1), 1101-1107.
4. Lomas, K.J., & Fiala, D. (2004). Simulation of the effects of temperature on comfort in buildings. Building and Environment, 39(6), 693-703. Clarke, J.A. (2001). Energy simulation in building design. Butterworth-Heinemann. ISBN: 978-0750626497. truck, R., & Weitz, A. (2009).
5. Design Builder: A graphical interface for building energy simulations. ASHRAE Transactions, 115(1), 1050-1060. Klemens, E., & Causone, F. (2013).
6. Modeling building energy systems with TRNSYS. International Journal of Energy and Environmental Engineering, 4(1), 1-11. Macumber, D., & O'Connor, D. (2012).
7. OpenStudio: A comprehensive open-source energy modeling platform. ASHRAE Journal, 54(10), 47-56.
8. CIBSE Guide A – *Environmental Design*, Chartered Institution of Building Services Engineers.

Evaluation Pattern: Marks allocation for SEE Term Work:

Subject Code	Subject	Portfolio	Report	Total
2MAAA 202	Building Performance Assessment (Simulation Software) SEE (Term Work)	40	10	50

SEMESTER – II

Advanced Structural Systems	
Course code: 2MAAA 203	Credits: 1:0:2
Pre-requisite: Nil	Contact Hours: 3 Hrs./ Wk.
Course Coordinator: Prof. Dr. Rajshekhar Rao	

Course objectives:

The course focuses on advanced structural systems, innovative materials, optimization techniques, and sustainable design for efficient and resilient engineering solutions.

Course Contents:

UNIT I

Structural systems in architecture and engineering, High-performance materials, Innovative structural solutions.

UNIT II

Structural analysis methods, Optimization techniques, parametric design and modeling, Structural efficiency metrics, Load distribution and stress analysis.

UNIT III

Computational tools in structural engineering, Dynamic structural systems, Seismic resistance design, Performance-based design (PBD).

UNIT IV

Material efficiency and lifecycle analysis, Smart structures and adaptive systems, Energy-efficient structural solutions, Integration of renewable energy in structures, Environmental impact analysis.

UNIT V

Performance-based structural innovations, Case studies of landmark structures, Future trends in structural engineering, Multi-disciplinary integration.

Course outcomes (COs):

The student will be able to

CO1 – Understand the Structural systems in architecture and engineering.

CO2 – Identify the structural analysis methods, Optimization techniques, parametric design and modeling.

CO3 – Develop performance based design.

CO4 – Analyze the Material efficiency, lifecycle analysis and Environmental impact analysis.

CO5 - Outline the Performance-based structural innovations

References:

1. Engel, H. *Structure Systems*. Hatje Cantz Publishers, 2007.
2. Schlaich, M., & Bergermann, R. *Light Structures: Structures of Light*. Birkhäuser, 2004.
3. Ashby, M. F., Shercliff, H., & Cebon, D. *Materials: Engineering, Science, Processing and Design*. Butterworth-Heinemann, 2019.
4. Hibbeler, R. C. *Structural Analysis*. Pearson, 2022.
5. Adeli, H., & Kamal, M. M. *Optimization of Large Structural Systems*. Springer, 1998.
6. Bechthold, M. *Innovative Surface Structures: Technologies and Applications*. Taylor & Francis, 2008.
7. Smith, I. F. C. *Smart Structures: Analysis and Design*. Wiley, 2013.
8. Nawy, E. G. *Prestressed Concrete: A Fundamental Approach*. Pearson, 2010.
9. Buchanan, A. H., & Honey, B. G. *Energy Efficiency in Buildings: Principles, Performance and Simulation*. Routledge, 2015.

SEMESTER – II

Elective II (Net Zero Buildings)	
Course code: 2MAAA 204/ 2MAAA E04	Credits: 3:0:0
Pre-requisite: Nil	Contact Hours: 3 Hrs./ Wk.
Course Coordinator: Ar. Sudha Kumari G	

Course objectives

- To understand the principles and concepts of Net Zero Energy Buildings (NZEB).
- To apply energy-efficient, passive, and renewable energy strategies in building design.

Course Contents

Unit I

Net Zero Buildings: Understand the Concept of Net Zero Energy Buildings: principles of energy efficiency, renewable energy integration, and sustainable construction. net-zero buildings in mitigating climate change and reducing the carbon footprint of the built environment.

Unit II

Analyse Building Energy Consumption and Efficiency: Identify the energy loads from heating, cooling, lighting, and appliances. strategies to improve energy efficiency, such as thermal insulation, high-performance glazing, air sealing, and energy-efficient HVAC systems.

Unit III

Renewable Energy Integration in Net Zero Buildings: Solar energy: Photovoltaic (PV) systems and solar thermal systems, Wind energy: Small-scale wind turbines for buildings Geothermal energy: Ground-source heat pumps and heating/cooling systems, Energy storage solutions: Batteries and thermal storage systems, integrating renewable energy systems into building design, Energy storage systems: To achieve net-zero goals

Unit IV

Passive design principles for energy optimization: Energy Modeling and Simulation for Net Zero Buildings, Smart Building Technologies for Energy Management, Carbon Footprint Reduction and Sustainability in NZEB

Unit V

NZEB standards, Net Zero Energy Building Certification Systems, Design and Planning for Net Zero Energy Buildings, Case Studies and Emerging Trends in Net Zero Buildings

Course Outcomes (COs):

The student will be able to

CO1: To Understand the Concept and Principles of Net Zero Energy Buildings (NZEB)

CO2: Design and Implement Energy-Efficient Strategies and Integrate Renewable Energy Systems in Building Design:

CO3: To acquire knowledge of energy storage solutions and their role in ensuring consistent energy supply and optimizing renewable energy use.

CO4: Understand and Apply Passive Design Principles for Energy Optimization

CO5: Competence in applying industry standards for energy efficiency and renewable energy systems, including LEED and Passive House standards.

Reference books:

1. "Net Zero Energy Design: A Guide for Commercial Architecture" by Thomas Hootman
2. "The Passive Solar House: Using Solar Design to Heat and Cool Your Home" by James Kachadorian
3. "Building Performance Analysis" by Peter Simmonds
4. "Energy Efficiency in Buildings" by David W. A. Reay
5. "Sustainable Construction: Green Building Design and Delivery" by Charles J. Kibert
6. "Journal of Building Performance"
7. "Renewable and Sustainable Energy Reviews" Energy and Buildings"

Evaluation Pattern: Marks allocation for SEE (Term work):

Subject Code	Subject	Portfolio	Report	Total
2MAAA 204/ 2MAAA E04	Elective-II Net zero buildings SEE (Term Work)	40	10	50

SEMESTER – II

Elective II (Virtual Reality and Augmented Reality in Architecture)	
Course code: 2MAAA 204/ 2MAAA E05	Credits: 3:0:0
Pre-requisite: Nil	Contact Hours: 3 Hrs./ Wk.
Course Coordinator: Prof Dr Rajshekhar Rao	

Course objectives

1. To introduce the use of Virtual Reality (VR) and Augmented Reality (AR) in architecture. Students will explore how these tools support design visualization, simulation, and communication.
2. To develop skills in 3D modeling and BIM integration using software like Rhino, SketchUp, Revit, and ArchiCAD for immersive design workflows.
3. To enable real-time visualization and interaction using tools such as Unity, Unreal Engine, and Twinmotion for architectural design and planning.

Course Contents:

UNIT I

Unit 1: Getting Started with XR and Digital Modeling- Introduction to XR: VR, AR, MR, and XR, how design moves from 2D to 3D to BIM to XR, Using Rhino and SketchUp for basic 3D design, Using Revit or ArchiCAD for detailed building models, Introduction to XR headsets and visualization software.

Tools Rhino, SketchUp – for simple 3D modeling, Revit, ArchiCAD – for BIM, Twinmotion, Enscape – for viewing designs in VR/AR

UNIT II

Unit 2: Making 3D Models Ready for VR and AR- Creating Interactive VR Experiences- How to clean up 3D models from Rhino, SketchUp, and Revit; Fix shapes, reduce size, and add simple materials; How to export models for VR/AR (like FBX or OBJ files); Simple idea of model types (Mesh and NURBS); How to keep models light by using fewer polygons; Intro to realistic materials (PBR)

Tools Covered: Rhino, SketchUp, Revit; Unity or Unreal (for VR/AR)

UNIT III

Unit 3: Augmented Reality (AR) for Architecture- Bring models from Rhino, SketchUp, or Revit into Unity or Unreal, set up VR scenes with lights, background (sky), and sound, make objects interactive (click to show info or trigger animations), Use Unity Reflect to view live BIM data in VR

Tools Covered: Rhino, SketchUp, Revit; Unity, Unreal Engine; Unity Reflect

UNIT IV

Unit 4: Using AR (Augmented Reality) in Architecture- What is AR and how it works, two types of AR: with a marker and without a marker, Use models from Rhino or SketchUp in phone-based AR, Place BIM models on real sites using AR, Learn basic AR tools: ARKit, ARCore, Vuforia, Unity

Tools Covered: Rhino, SketchUp, Revit, Unity, ARKit, ARCore, Vuforia

UNIT V

Unit 5: Applications, Ethics, and Project- XR in architectural practice: design, heritage, planning, Ethics in immersive environments: data ownership, accessibility, BIM + XR for Digital Twins; Project execution and presentation.

Tools Covered: Any platform chosen by the student (Unity, Unreal, Enscape, Twinmotion), Integration of BIM and 3D modeling software as appropriate

Course outcomes (COs):

The student will be able to

CO1 - Understand and compare XR technologies and their roles in architectural visualization.

CO2 - Integrate models from Rhino, SketchUp, and Revit into real-time immersive environments.

CO3 - Optimize architectural models for performance and realism in VR/AR experiences.

CO4 - Build and deploy interactive VR walkthroughs and mobile AR overlays using Unity or Unreal.

CO5 - Apply immersive technologies critically in architectural projects, with consideration for usability, ethics, and stakeholder engagement.

References:

1. *The Language of Mixed Reality* – Jesse Damiani
2. *The BIM Handbook* – Eastman et al.
3. *Augmented Reality for Designers* – T. Hollerer
4. Official docs: Unity, Unreal, Rhino.Inside, SketchUp Viewer AR
5. Mortenson, M. E. *Virtual Reality and Augmented Reality in Industry*. Wiley-Blackwell, 2015.
6. Santana, F., & Knippel, E. *Architectural Visualization with Unreal Engine*. Packt Publishing, 2020.
7. Bartle, R. *Designing Virtual Worlds*. New Riders, 2003.
8. Linowes, J., & Babilinski, K. *Augmented Reality for Developers: Build Practical Augmented Reality Applications with Unity, ARCore, and Vuforia*. Packt Publishing, 2017.
9. Zlatanova, S., & Ledoux, H. (Eds.). *Urban and Regional Data Management: UDMS 2013*. CRC Press, 2013.
10. Kensek, K. M., & Noble, D. E. (Eds.). *Building Information Modeling: BIM in Current and Future Practice*. Wiley, 2014.
11. Wang, X., & Schnabel, M. A. (Eds.). *Collaborative Design in Virtual Environments*. Springer, 2008.
12. Dieck, M. C. T., & Jung, T. (Eds.). *Augmented Reality and Virtual Reality: The Power of AR and VR for Business*. Springer International Publishing, 2018.
13. Hale, K. S., & Stanney, K. M. (Eds.). *Handbook of Virtual Environments: Design, Implementation, and Applications*. CRC Press, 2015.

Evaluation Pattern: Marks allocation for SEE (Term work)/:

Subject Code	Subject	Portfolio	Report	Total
2MAAA 204/ 2MAAA E05	Elective -II Virtual Reality and Augmented Reality in Architecture SEE (Term Work)	40	10	50

SEMESTER – II

Elective II (Land Use Structure and Urban Morphology)	
Course code: 2MAAA 204/ 2MAAA E06	Credits: 3:0:0
Pre-requisite: Nil	Contact Hours: 3 Hrs./ Wk.
Course Coordinator: Prof. Dr Monalisa	

Course objectives

- To understand urban morphology through perception, cognition and spatial aspects of a city structure.

Course contents

Unit I

Interpreting the urban geography: Introduction to urban geography – Understanding Urban Geography through: Cognition, perception and spatial representation. Students are introduced to AI-enabled and data-driven techniques—such as GIS-based spatial analysis, machine learning for pattern recognition, mobility data analysis, and predictive urban modeling—to interpret urban behavior and spatial dynamics. These tools support sustainable planning by enabling evidence-based decisions, scenario testing, and optimization of urban systems for environmental performance, accessibility, and social well-being.

Unit II

Morphology of habitat structures: Students are introduced to ideal-space diagrams and city form analysis using both traditional morphological methods and AI-driven tools. Digital mapping, spatial analytics, and machine-learning-based pattern recognition are explored to evaluate historical and contemporary urban forms. These approaches enable comparative analysis, and the development of data-informed, sustainable urban design strategies.

Unit III

Mapping sacred geography: Students are introduced to contemporary methods of mapping the sacred using GIS, remote sensing, spatial databases, and AI-driven analytical tools. These techniques enable the documentation, visualization, and interpretation of intangible cultural values and their spatial manifestations.

Unit IV

Rhythms of the city: Modern work rituals and the definition of fragmented zones, time space and lives. Nightlife and electronic definition of time. Significance, Signs and meaning of structure. Imagined places, collage of time space representations in Literature, Cinema and the Performing Arts. Students are introduced to AI-enabled and data-driven methods—such as temporal GIS, mobility and activity data analysis, and pattern recognition—to map and interpret urban rhythm

Unit V

Urban growth and system of cities: Growth of metropolitan and mega cities: scale, complexity. Metropolitan growth– Trends, characteristics, challenges, socio-economic and political issues in India and other Asian Geographies. Case studies from India and other Asian geographies are used to examine diverse trajectories of urbanization under conditions of rapid growth, demographic change, and climate vulnerability. AI-driven and data-based approaches—such as urban growth

modeling, satellite imagery analysis, spatial big data, and predictive analytics—are introduced to study metropolitan expansion and system-level interactions.

Course Outcomes (COs):

The student will be able to

CO1: Analyze and understand the city distribution patterns and urban geography through cognition, perception, spatial representation, and cognitive mapping using both contemporary and traditional methods.

CO2: Understand the historical transformation of habitat structures, and the impact of idealized space concepts in city planning.

CO3: Outline the relationship between astronomy, city structure, and sacred geography, through Mapping.

CO4: Acquire knowledge about the rhythms of urban life through various modern work rituals.

CO5: Understanding the Urban growth and system of cities.

Reference books:

1. The Image of the City by Kevin Lynch — A foundational text on urban form, perception, and city structure.
2. Urban Morphology: An Introduction to the Study of the Physical Form of Cities by Vitor Oliveira — Introduces theories and methods of urban morphology and spatial structure.
3. Good City Form by Kevin Lynch — Explores urban spatial organization, land use, and the quality of urban environments.
4. The Social Logic of Space by Bill Hillier and Julienne Hanson — A major work linking urban morphology with spatial analysis and land-use patterns.
5. Cities of Tomorrow by Peter Hall — Discusses the evolution of urban planning, land-use structure, and city development models.
6. Spiro Kostoff, “City shaped”, Bulfinch, Reprint Edition, 1993.
7. Sumita Ghosh, “Introduction to settlement geography”, Orient BlackSwan, 1998.
8. Michael Pacione, “Urban Geography: A Global perspective”, Routledge; 1st Edition, 2009.
9. Paul L Knox, “Urbanization”, Pearson, 2012.
10. Diana L. Eck, “India: A Sacred Geography”, Three Rivers Press, 2013

Evaluation Pattern: Marks allocation for SEE (Term Work):

Subject Code	Subject	Portfolio	Report	Total
2MAAA 204/ 2MAAA E06	Elective-II Land use structure & Urban Morphology SEE (Term Work)	40	10	50

CURRICULUM

Outcome Based Education
(Effective from the Academic Year 2026-2027)

SCHOOL OF ARCHITECTURE

III Semester M. Arch (Advanced Architecture)

RAMAIAH INSTITUTE OF TECHNOLOGY

(Autonomous Institute, Affiliated to VTU)

Bangalore -560054

SEMESTER –III

THESIS PROJECT	
Course Code: 2MAAA 301	Credits: 0:0:12
Prerequisite: Nil	Contact Hours: 12Hrs./ Wk.
Course Coordinator: Prof. Dr. Rajshekhar Rao	

Course objectives:

- To enable students to undertake a thesis project of their choice by integrating knowledge from various subjects towards developing sustainable and technically sound design solutions.
- To develop the ability to analyze and resolve issues related to building performance, environmental response, and sustainability in architectural design.

Course Contents:

UNIT I

Selection of thesis topic: Relevance and justification- Preparation of Synopsis with aims, objectives, limitations, and scope.

UNIT II

Literature Case study and documentation, formulate a methodology for the project.

UNIT III

Analysis and synthesis of data: Design development, sustainability.

UNIT IV

Innovation in design: Innovative solutions with technical execution and performance analysis.

UNIT V

Structuring a comprehensive thesis report: critical analysis, conclusions and recommendations.

Course outcomes (COs):

The student will be able to

CO1 - Analyze the relevance of a thesis topic, justify its selection, and formulate clear and structured aims, objectives, limitations and scope.

CO2 - Evaluate case studies and existing literature to develop a well-defined methodology for their project.

CO3 - Apply techniques for data analysis and synthesis to develop a sustainable design solution addressing project requirements.

CO4 - Create innovative design solutions that incorporate technical execution and performance analysis for real-world challenges.

CO5 - Structure a comprehensive thesis report by demonstrating an understanding of critical analysis, conclusions and recommendations.

References:

1. Groat, L., & Wang, D. *Architectural Research Methods*. Wiley, 2013.
2. Creswell, J. W., & Creswell, J. D. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications, 2018.
3. Neuman, W. L. *Social Research Methods: Qualitative and Quantitative Approaches*. Pearson, 2014.
4. Blessing, L. T. M., & Chakrabarti, A. *DRM, a Design Research Methodology*. Springer, 2009.
5. Yin, R. K. *Case Study Research and Applications: Design and Methods*. SAGE Publications, 2018.
6. Lawson, B. *How Designers Think: The Design Process Demystified*. Architectural Press, 2006.
7. Bryan, B., & Erskine, J. *Design Studio: Crafting Creative Processes*. Routledge, 2013.
8. Biggs, J., & Tang, C. *Teaching for Quality Learning at University*. McGraw-Hill Education, 2011.
9. Lang, J., & Moleski, W. H. *Functionalism Revisited: Architectural Theory and Practice and the Behavioral Sciences*. Routledge, 2017.
10. Borden, I., & Ruedi, K. *The Dissertation: An Architecture Student's Handbook*. Routledge, 2014.

Evaluation Pattern: Marks allocation for SEE (Viva Voce):

Subject Code	Subject	Portfolio	Viva voce	Total
2MAAA 301	Thesis Project SEE (Viva Voce)	40	10	50

SEMESTER –III

Advanced Building Systems Integration	
Course Code: 2MAAA 302	Credits: 0:0:3
Prerequisite: Nil	Contact Hours: 3Hrs./ Wk.
Course Coordinator: Prof. Dr. Rajshekhar Rao	

Course objectives:

- To develop a deep understanding of building envelope systems, environmental performance, and their impact on occupant comfort and energy use.
- To equip students with the knowledge of renewable, climate-responsive, and energy-efficient building systems for sustainable architecture.
- To enable critical comprehension of smart building concepts, integrated systems design, and the theoretical foundations of energy-efficient, complex architectural systems.

Course Contents:

UNIT I

Building Envelope Systems and Environmental Performance: Theoretical understanding of the building envelope as an integrated environmental moderator; Fundamental relationships between climate, energy, comfort, and envelope design, Passive design strategies (orientation, shading, thermal mass, natural ventilation) and their theoretical basis, Active envelope systems and their role in energy performance, Performance-based evaluation of envelope systems.

UNIT II

Renewable and Climate-Responsive Building Systems: Theoretical principles of renewable energy systems in buildings, including solar, wind, and hybrid systems; Integration of renewable systems in smart and high-performance buildings; Passive and active climate-responsive design strategies; Building energy modeling and performance optimization; Water and waste management systems for sustainable architecture. Case studies of high-performance, climate-adapted buildings

UNIT III

Principles of systems integration in large-scale and complex buildings: Coordination of HVAC, structural, electrical, and architectural systems; Life-cycle assessment and performance-based design; Computational and BIM-based approaches to system integration; Risk management and troubleshooting in integrated systems

UNIT IV

Smart building technologies: IoT, sensors, automated controls, and digital twins; Adaptive and responsive building systems; Data-driven design and performance monitoring; Human-centered and comfort-focused approaches; Case studies on smart building applications and emerging trends

UNIT V

Principles of energy-efficient building design: Building rating systems (LEED, BREEAM, GRIHA, etc.), Performance metrics, monitoring, and optimization strategies, Integration of sustainable

systems in design, operation, and maintenance, Future trajectories in sustainable architecture and regenerative design

Course outcomes (COs):

The student will be able to

CO1 - Analyze and evaluate building envelope systems for thermal, acoustic, and environmental performance in diverse contexts

CO2 - Design and assess renewable and climate-responsive building systems that optimize environmental performance and sustainability.

CO3 - Apply systems integration principles to coordinate complex building systems for functional, sustainable, and high-performance outcomes.

CO4 - Critically evaluate smart building concepts and develop design strategies integrating technology for efficiency and occupant comfort

CO5 - Synthesize theoretical foundations of energy efficiency to design and evaluate sustainable building systems for contemporary architecture.

References:

1. Banham, R. *The Architecture of the Well-Tempered Environment*. University of Chicago Press, 1984.
2. Givoni, B. *Passive and Low Energy Cooling of Buildings*. Wiley, 1994.
3. Szokolay, S. V. *Introduction to Architectural Science: The Basis of Sustainable Design*. Routledge, 2014.
4. Ramaswamy, M. *Mechanical and Electrical Equipment for Buildings*. Wiley, 2019.
5. Kwok, A. G., & Grondzik, W. T. *The Green Studio Handbook: Environmental Strategies for Schematic Design*. Routledge, 2018.
6. Eastman, C., Teicholz, P., Sacks, R., & Liston, K. *BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers*. Wiley, 2018.
7. Yudelson, J. *Green Building A to Z: Understanding the Language of Green Building*. New Society Publishers, 2007.
8. Guy, Simon – *Sustainable Architecture*
9. Smith, Peter – *Smart Buildings and Intelligent Environments*
10. Lechner, Norbert – *Heating, Cooling, Lighting: Sustainable Design Methods*
11. Gero, John – *Computational Models in Architecture*
Davis, Mike – *Building Performance Simulation for Design and Operation*
12. Kibert, Charles – *Sustainable Construction: Green Building Design and Delivery*
13. Al-Homoud, M. – *Building Envelope Systems for Energy Efficiency*
14. Becque, Sandra – *Renewable Energy Integration in Buildings*

Evaluation Pattern: Marks allocation for SEE

Subject Code	Subject	Portfolio	Report	Total
2MAAA 302	Advanced Building Systems Integration SEE (Term Work)	40	10	50

SEMESTER –III

Project Management	
Course Code: 2MAAA 303	Credits: 1:0:1
Prerequisite: Nil	Contact Hours: 2Hrs./ Wk.
Course Coordinator: Prof. Dr Monalisa	

Course objectives:

- To understand the principles, processes, and organizational aspects of construction project management, including project planning, stakeholder coordination, and the roles of project managers.
- To apply project planning, scheduling, monitoring, and control techniques such as WBS, CPM, PERT, cost management, quality control, and risk management in construction projects.

Course Contents:

UNIT I

Introduction to project management: Introduction to project, its stages, and construction project management: project, organization, need for management of building/construction projects, principles and objectives of project management, brief understanding about study areas in project management. Types of construction projects. Project, program, and portfolio management, difference between a Project manager and a project engineer/project leader, The duties of a project manager/project leader, project life cycle, and project management process.

UNIT II

Basics of project management: Project life cycle, types of projects, phase of project, project management and its relevance, stakeholders of a project, structure of project organization, management levels, failures, and success of a project.

UNIT III

Roles of Project Manager: Roles & Responsibilities of Project/ Construction Managers, Scope Management in Construction: Scope Planning, Definition, Verification, and Control Project Management Stages: Project planning, project scheduling, and project controlling.

UNIT IV

Project planning & scheduling: Introduction, time cost, and resource management, project planning, work breakdown structure (W.B.S.), planning terminologies, time scheduling techniques, network theories -CPM, PERT, project crashing.

UNIT V

Project monitoring and control: Introduction, scope verification & control, feasibility report, schedule control, cost control, quality control, performance reporting, risk control and contract administration.

Course outcomes (COs):

The student will be able to

CO1 – Understand the comprehensive concepts of project management, stages of a project, and principles required for successful project execution.

CO2 – Evaluate the factors contributing to project success or failure and apply management techniques to oversee projects across various phases and organizational levels.

CO3 – Understand the roles of the Project Manager, and effectively manage scope through planning and Project managing phases.

CO4 – Identify the required technology in project planning.

CO5 - Demonstrates the projects effectively including the management of scope, time, cost, and quality satisfying the needs for which the project was undertaken.

References:

1. Association for Project Management. *APM Body of Knowledge*. Association for Project Management, 2012.
2. Guide, A. *Project Management Body of Knowledge (PMBOK® Guide)*. Project Management Institute, 2017.
3. Krishnamurthy, K.G., and Ravindra, S.V. *Construction and Project Management*. 2008.
4. Hendrickson, C., Hendrickson, C.T., and Au, T. *Project Management for Construction: Fundamental Concepts for Owners, Engineers, Architects, and Builders*. Chris Hendrickson, 1989.
5. Hendrickson, C. *Project Management for Construction: Fundamental Concepts for Owners, Engineers, Architects, and Builders*. Department of Civil and Environmental Engineering, 2003.
6. Punmia, B.C., and Khandelwal, K.K. *Project Planning and Control with PERT & CPM*. Firewall Media, 2002.
7. Jha, K.N. *Construction Project Management: Theory and Practice*. Pearson Education India, 2015.

SEMESTER –III

Elective-III - Impact Assessment of Environment	
Course Code: 2MAAA 304/ 2MAAA E07	Credits: 3:0:0
Prerequisite: Nil	Contact Hours: 3Hrs./ Wk.
Course Coordinator: Ar. Sudha Kumari G	

Course objectives:

This course provides a comprehensive understanding of environmental management, environmental planning, and management techniques.

Course Contents:

UNIT I

Introduction to environmental management; concepts of ecosystem; ethics and environment; environmental management tools. Environmental movements in the world. Environmental pollution and environmental concerns in India. Impact of human settlements, industries, dams, national parks, etc. on the environment. Evolution of EIA across the world and India.

UNIT II

Environmental Impact Assessment - Definitions, purpose, steps, hierarchy, impact indicators and forecasting environmental changes. Strategic environmental assessment (SEA): Rationale and scope, process, benefits and constraints. Environmental clearance procedure in India.

UNIT III

EIA documentation and processes: Stages; impact prediction, evaluation, and mitigation; impact on decisions; public participation; requisites and review of EIS.

UNIT IV

Environmental management plan – strategies, approaches of environmental protection. Environmental monitoring. Environmental auditing: Objectives and scope, types, methodology.

UNIT V

EIA notifications by MoEF CC. Environmental and town planning legislations dictating the EIA procedures: (Air act; Water act, EPA act). Role of a landscape architect in EIA.

Course outcomes (COs):

The student will be able to

CO1- Explain the fundamental concepts of environmental management, including ecosystem ethics, environmental tools, and the evolution of EIA globally and in India.

CO2- Analyze the steps, hierarchy, and processes involved in Environmental Impact Assessment, including Strategic Environmental Assessment and environmental clearance procedures in India.

CO3- Evaluate EIA documentation processes such as impact prediction, mitigation, public participation, and Environmental Impact Statements (EIS).

CO4- Apply environmental management strategies and monitoring methods, including environmental auditing, to develop comprehensive environmental protection plans.

CO5- Create integrated solutions addressing environmental challenges by synthesizing knowledge of MoEF & CC notifications, legislative frameworks, and the role of landscape architects in EIA.

References:

1. Spens, M. The Complete Landscape Design and Gardens of Geoffrey Jellicoe. Thames & Hudson, 1994.
2. Turnbull, W. Jr. The Poetics of Gardens. MIT Press, 1992.
3. Glasson, J., Therivel, R., & Chadwick, A. Introduction to Environmental Impact Assessment. Routledge, 2013.
4. Canter, L. W. Environmental Impact Assessment. McGraw-Hill, 1996.
5. Sadler, B., & McCabe, M. Strategic Environmental Assessment: Concepts and Practices. Earthscan, 2002.
6. Noble, B. F. Introduction to Environmental Impact Assessment: A Guide to Principles and Practice. Oxford University Press, 2014.

Evaluation Pattern: Marks allocation for SEE (Term Work)

Subject Code	Subject	Portfolio	Report	Total
2MAAA 304/ 2MAAA E07	Elective -III Impact Assessment of Environment SEE (Term Work)	40	10	50

SEMESTER –III

ELECTIVE-III	
Elective-III - Prompt Engineering and Generative AI for Architectural Design	
Course Code: 2MAAA 304/ 2MAAA E08	Credits: 3:0:0
Prerequisite: Nil	Contact Hours: 3Hrs./ Wk.
Course Coordinator: Ar Ashwini Mani	

Prompt Engineering and Generative AI for Architectural Design

Course objectives:

- To introduce students to the principles, capabilities, and limitations of generative artificial intelligence and prompt engineering in architectural and urban design contexts.
- To develop the ability to formulate effective prompts that translate architectural intent, sustainability goals, and design constraints into meaningful AI-generated outputs.
- To enable critical and ethical integration of generative AI tools within architectural design workflows, visualization, and performance-informed decision-making.

UNIT I

Foundations of Generative AI in Architecture: Introduction to artificial intelligence, machine learning, and generative models. Evolution of computational design to generative AI in architecture. Types of generative AI: text-to-image, text-to-3D, image-to-image, multimodal systems. Understanding model behavior, limitations, hallucination, bias, and uncertainty. Role of AI as a design assistant versus design author.

UNIT II

Prompt Engineering Principles and Design Intent: Prompt engineering as a design skill: structure, syntax, semantics, and context-setting. Translating architectural intent into textual, visual, and parametric prompts. Visual prompting using sketches, diagrams, site images, and precedent studies. Evaluation and refinement of AI outputs based on architectural criteria.

UNIT III

Generative AI in Architectural Design Workflows: Application of generative AI in site analysis, conceptual design, massing studies, façade exploration, climate-responsive and sustainable design ideation. Integration with CAD, BIM, and parametric platforms. AI-assisted diagramming, storytelling, and design narratives.

UNIT IV

AI for Visualization, Performance, and Sustainability: AI in environmental analysis, daylighting concepts, material optimization, and energy-aware design prompts. Scenario generation for climate resilience and urban sustainability. Generative AI for post-occupancy insights, user experience simulation, and design optimization. Limitations of AI in quantitative performance evaluation.

UNIT V

Ethics, Practice, and Future Directions: Ethical considerations in generative AI: authorship, originality, copyright, data bias, and cultural sensitivity. Legal implications and professional responsibility in architectural practice. AI and the future of architectural labor, creativity, and pedagogy. Critical review of AI-driven architectural projects and speculative futures. Developing an informed, ethical, and strategic approach to AI adoption in design practice.

Course outcomes (COs):

The student will be able to

CO1: To develop conceptual understanding and architectural relevance of generative AI.

CO2: To learn to communicate architectural intent effectively to AI systems.

CO3: To learn to embed AI within real architectural design processes.

CO4: To use AI to support sustainable and performance-driven design thinking.

CO5: To understand critical, ethical, and forward-looking engagement with AI.

References:

1. Neil Leach – Architecture in the Age of Artificial Intelligence — foundational exploration of how AI impacts architectural practice, creativity, and design thinking.
2. Imdat As & Prithwish Basu (eds.) – The Routledge Companion to Artificial Intelligence in Architecture — comprehensive coverage of AI theory, tools, methods, and architectural applications.
3. Daniel Koehler – Compositional Intelligence: Architectural Typology Through Generative AI — investigates generative AI models in architectural typology and urban design.
4. Asterios Agkathidis, Markus Hudert & Carlos Medel-Vera (eds.) – Architecture in the AI Era for Research, Practice, and Pedagogy — cutting-edge methods for integrating generative AI in spatial design processes.
5. Asterios Agkathidis – AI-Assisted Architectural Design: Generative Form-Finding Methods Using Artificial Intelligence — practical guide to leveraging AI for form exploration and generative design workflows.
6. Springer (ed.) – Artificial Intelligence-Aided Design for Sustainability — focuses on AI's role in sustainable design and performance-oriented architectural processes.
7. Herbert A. Simon – The Sciences of the Artificial — classic design theory text linking computational thinking and artificial systems to architectural problem-solving.
8. Stuart J. Russell & Peter Norvig – Artificial Intelligence: A Modern Approach — authoritative AI textbook covering core models and techniques foundational to prompt engineering (useful for deeper technical grounding).

Evaluation Pattern: Marks allocation for SEE Viva Voce

Subject Code	Subject	Portfolio	Report	Total
2MAAA 304/ 2MAAA E08	Elective-III Prompt Engineering and Generative AI for Architecture Design SEE (Term Work)	40	10	50

SEMESTER –III

ELECTIVE-III	
Elective-III - Advanced Theory of Design: Architecture and Human Settlements	
Course Code: 2MAAA 304/ 2MAAA E09	Credits: 3:0:0
Prerequisite: Nil	Contact Hours: 3Hrs./ Wk.
Course Coordinator: Prof Dr. Monalisa	

Course objectives:

- To develop a comprehensive understanding of human settlements and urban systems through the lens of sustainability, regenerative design, low-carbon development, and intelligent technologies.
- To equip students with the ability to analyze urban form, socio-spatial dynamics, and ecological systems using computational tools, GIS, data analytics, and AI-assisted modeling techniques.
- To foster critical thinking in addressing social equity, inclusivity, and ethical challenges in contemporary urban and architectural design, particularly in data-driven and AI-enabled planning contexts

Course Contents:

UNIT I

Human Settlements, Sustainability, and Intelligent Systems: Principles of sustainable settlements, regenerative design, circular economy concepts, low-carbon development, and the role of artificial intelligence in environmental analysis and settlement planning.

UNIT II

Urbanism, Data, and Socio-Spatial Equity: City form and structure: morphology, land-use patterns, density, and infrastructure networks analyzed through computational tools. Urban dynamics including migration, growth, informality, and spatial transformation supported by GIS, urban analytics, and AI-based simulations. Social equity in urban design: gentrification, inclusivity, accessibility, and ethical implications of AI in planning.

UNIT III

Urban Ecology, Climate Resilience, and Computational Sustainability: Green and blue infrastructure systems, nature-based solutions, and ecosystem services in urban environments. AI-assisted environmental modeling for climate-responsive design, heat island mitigation, flood management, and energy optimization. Public spaces as socio-ecological and climate-adaptive infrastructures.

UNIT IV

Architecture, Identity, and Intelligent Urban Technologies: Context-sensitive design approaches including critical regionalism, vernacular intelligence, and climate-responsive traditions augmented by digital tools. Smart cities, Internet of Things (IoT), Building Information Modeling (BIM), generative design, and artificial intelligence in balancing cultural continuity, sustainability, and technological innovation.

UNIT V

Global Practices, Research Methods, and Future Trajectories: Case studies of successful, experimental, and failed urban interventions with emphasis on sustainability metrics and technological integration. Research methodologies in advanced architectural and urban theory, including computational research, parametric modeling, simulation-based design, and data ethics. Future directions in artificial intelligence–driven architectural practice.

Course outcomes (COs):

The student will be able to

CO1- To understand principles of human settlements by integrating sustainable, regenerative, and low-carbon design approaches with AI-enabled environmental analysis and settlement planning strategies.

CO2- To understand urban form, spatial structure, and socio-spatial dynamics using computational tools, GIS, urban analytics, and AI-based simulations, while addressing issues of equity, inclusivity, and ethical planning.

CO3- To relate urban ecological principles, nature-based solutions, and AI-assisted environmental modeling to develop climate-responsive, resilient, and performance-driven urban design strategies.

CO4- To critically assess context-sensitive architectural approaches and smart urban technologies to balance cultural identity, sustainability, and intelligent design innovation.

CO5- To undertake global case studies and advanced research methodologies to formulate informed, ethical, and future-ready architectural and urban design propositions driven by emerging AI technologies.

References:

1. Imdat As, Prithwish Basu & Pratap Talwar (Eds.) – *Artificial Intelligence in Urban Planning and Design* – comprehensive coverage of AI tools, implementation, impacts, and case studies in urban design, city planning, and intelligent systems.
2. Carl Bovill – *Sustainability in Architecture and Urban Design* – essential grounding in sustainability principles for architecture and urbanism, covering ecology, urban scale impacts, and environmental strategies.
3. Federico Cugurullo et al. (Eds.) – *Artificial Intelligence and the City: Urbanistic Perspectives on AI* – explores how AI intersects with urban society, infrastructure, planning, and sustainability trends.
Mitra Kanaani (Ed.) – *The Routledge Companion to Smart Design Thinking in Architecture & Urbanism for a Sustainable, Living Planet* – wide-ranging resource on smart design, sustainable living environments, and digital technologies in urban design.
4. Uday Chatterjee et al. (Eds.) – *Advances in Urbanism, Smart Cities, and Sustainability* – integrates smart cities, AI, IoT, GIS, and sustainable urban systems with diverse global perspectives.
5. Ata Chokhachian, Michael U. Hensel & Katia Perini (Eds.) – *Informed Urban Environments: Data-Integrated Design for Human and Ecology-Centred Perspectives* – focuses on data-driven design, urban adaptation, and ecology-centered planning.
6. Springer – *Smart and Sustainable Cities and Buildings* – research-backed collection on smart, resilient, and sustainable built environments (conference proceedings).
7. Simon Elias Bibri – *Advances in the Leading Paradigms of Urbanism and Their Amalgamation* – integrates ecological urbanism, compact cities, and data-driven smart sustainable urbanism.
8. Springer – *Urban-Rural Dialogue in Green City Design* – addresses urban ecology and socio-ecological systems for green city strategies.

9. Springer – *Towards the Framework of Livable and Resilient Cities* – covers sustainable architecture, green energy, and urban resilience frameworks.

Evaluation Pattern: Marks allocation for SEE (Term Work)

Subject Code	Subject	Portfolio	Report	Total
2MAAA 304/ 2MAAA E09	Elective-III Advanced Theory of Design: Architecture and Human Settlements SEE (Term Work)	40	10	50

CURRICULUM

Outcome Based Education
(Effective from the Academic Year 2026-2027)

SCHOOL OF ARCHITECTURE

IV Semester M. Arch (Advanced Architecture)

RAMAIAH INSTITUTE OF TECHNOLOGY

(Autonomous Institute, Affiliated to VTU)

Bangalore -560054

SEMESTER IV

Practical Training	
Course Code: 2MAAA 401	Credits: 0:0:20
Prerequisite: Nil	Contact Hours: Internship
Course Coordinator: Prof. Dr. Rajshekhar Rao	

Course Objectives:

- To train students in advanced architectural practice through live projects and professional workflows, culminating in a critical, postgraduate-level project report.

Course Contents

- Study and critical analysis of completed live projects designed by the Advanced architect. Gaining hands-on experience in a real-world architectural setting.
- Understanding the day-to-day operations of an architectural firm.
- Learning about project management, client relations, and team collaboration
- Working with other disciplines (e.g., engineering, landscape architecture, urban planning) to address complex design challenges.
- Through site visits gain practical knowledge, Exposure to Client-Architect relationship.

Practical Training Project Report (Mandatory)

- Preparation and submission of a Practical Training Project Report equivalent to a postgraduate project work.
- The report shall document one major live project (or a coherent package of work from two projects) undertaken during professional training.
- The report shall include: Introduction to the architectural firm and project background; Project brief, scope, and design intent; Design development process and drawings; Building materials, construction technology, and systems integration; Site involvement, coordination with consultants, and execution stages; Critical analysis of architectural, technical, and professional decisions; Reflections on learning outcomes and professional growth

Course Outcomes (COs):

CO1: Understanding of the various types of architectural projects and the process of designing. (PSO1)

CO2: Learning the skill of producing detailed drawings for construction and on-site execution. (PSO1)

CO3: Understanding of design development and detailing of architectural projects. (PSO1)

CO4: Exposure to professional architectural practice in response to the demands of the industry. (PSO3)

CO5: Demonstration of professional competence through documentation, critical analysis, and preparation of a professional training project report, supporting readiness for independent practice. (PSO3)

Performance shall be evaluated through Viva voce

The Viva Voce examination shall be conducted based on the following:

- Professional Training Portfolio

- Critical analysis report of two live projects
- Practical Training Project Report

Note: Students should work under an Architect who is a registered architect from the Council of Architecture. The Certificate should be signed and the registration number must be mentioned.

Evaluation Pattern: Marks allocation for SEE (Viva Voce):

Subject Code	Subject Name	Portfolio	Viva Voce	Total
2MAAA 401	Practical Training (SEE Viva Voce)	40	10	50