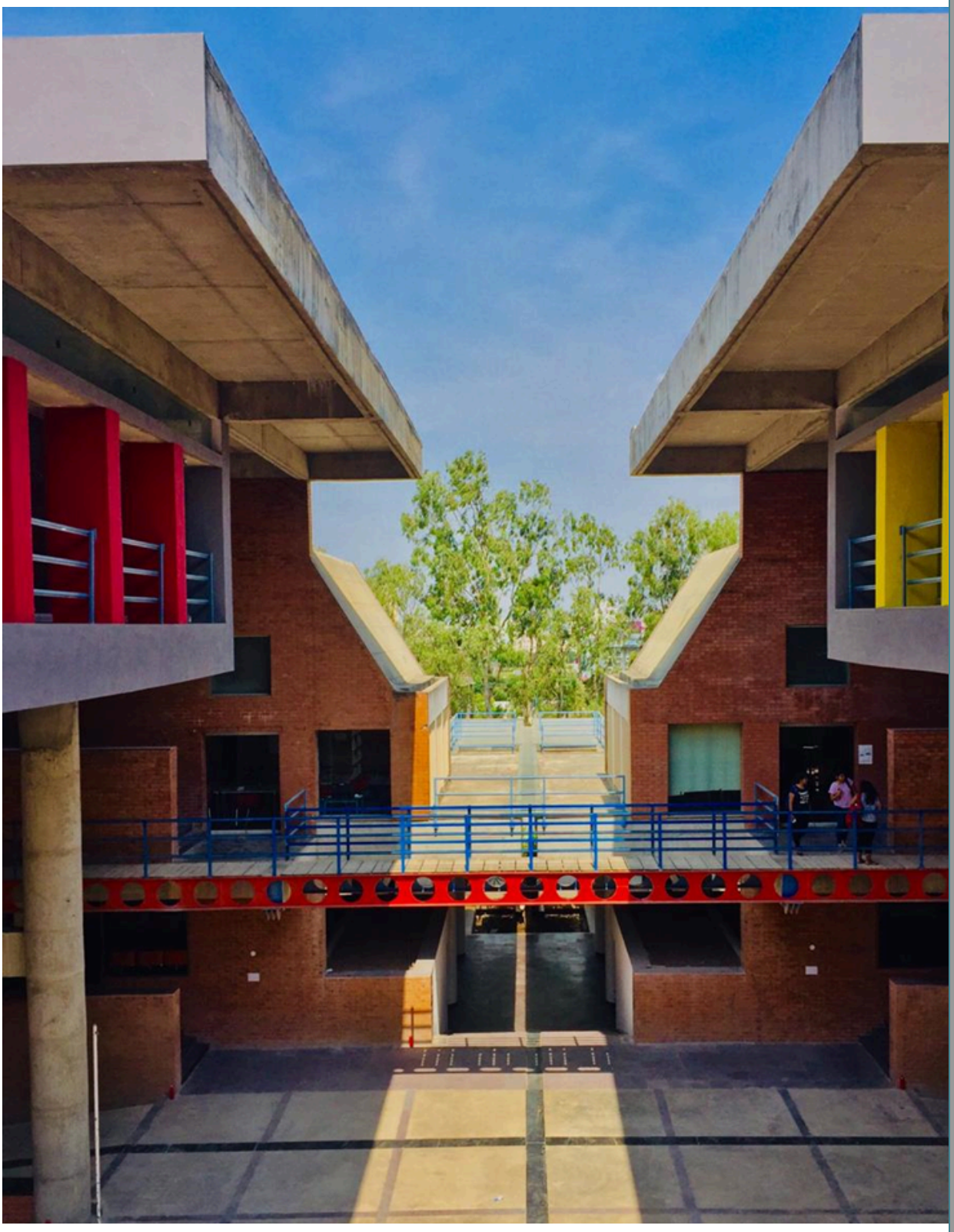
RESEARCH WORKSHOPS 2023- 24



Names of Faculty:

Dr. Vaidehi Lavand

Ar. Rasika Apte

S.M.E.F.'S Brick School of Architecture

Design of exercises to meet the teaching objectives:

The lecture inputs were designed for the students to comprehend the importance of research as an integral part of the architectural design process. The assignment explorations were planned to align with the course objective of introducing the students to various terminologies/ methods in Architectural Research and to enable them to prepare a research proposal.

Faculty Interpretation of the assignments:

Topic of Exploration	Submission Requirement	Date
Literature Review	A4 sheet	06/03/2024
Exploring Mendeley	A4 sheet	08/03/2024
Technical Writing	A4 sheet	29/03/2024
Research Methodology Chart	A4 sheet	03/01/2024
Research Topic FInalization- Final Proposal	A3 poster presentation in Research Jatra, A4 sheet	18/03/2024

Literature review

- Aim of the exercise: To understand the process of literature review
- Designed for: Analytical learners, Visual and Auditory learners
- Method adopted and duration: Excel sheet format with matrix for literature review
- Expectations from Students: Analyzing various components of their chose research papers in the simple format give
- Format for Output: Excel sheet highlighted with review and their inferences converted to PDF
- Summary with basic observations: This helped students in understanding different research papers, questions explored, methods adopted, data collection and analysis done as well as how the researchers arrived to the conclusions
- Example of a good work:

Name of the Student: Vedadnya Vakil							
	Data Collection and Analysis Matrix						
Sr No	Research Paper	Research Paper 1	Research Paper 2	Research Paper 3	Research Paper 4	Research Paper 5	Inferences for my research topic
1	Title of Research paper and name of the Author	Design of a set of habitat units and the corresponding surrounding cluster for long-term scientific missions in the pre-terraforming era on Mars. Author -Kasra Amini a b, Mojgan Moradi c, Peyman Ebadi Belfeh Teymoori c, Bahareh Vossoughi d e, Ehsan Dehghani Janabadi c, Rima Fayaz c	Towards sustainable horizons: A comprehensive blueprint for Mars colonization Author -Florian Neukart	A 3D-Printing Centered Approach to Mars Habitat Architecture and Fabrication. Author - Matthew Troemner, Elham Ramyar, Jonathan Meehan, Benton Johnson, Nima Goudarzi, Gianluca Cusatis*	The Mars Habitat. Author - Eckersley O'Callaghan and HASSELL architects	Designing for Life on Mars: Bio-Composite Materials, 3D Printing and Extraterrestrial Architecture. Author - Tian wang.	Architecture Beyond Earth- A Martian habitat author - Vedadnya Vakil
2	Research Question (Theme)	The research question, or theme, is centered on designing sustainable habitats for long-term human habitation on Mars, addressing engineering challenges for survival and thriving in the planet's hostile environment	addressing the Multifaceted Challenges and Opportunities of Establishing a Sustainable Human Colony on Mars"	What are the key design considerations and architectural solutions for sustainable human habitation on Mars, with a focus on 3D-printing technology?	How can architectural design and construction methods be optimized to create sustainable and habitable habitats for human colonization on Mars?"	"How can advancements in material science, architectural design, and sustainable systems contribute to the development of viable habitats for human colonization on other planets, considering the unique challenges and opportunities presented by extraterrestrial environments?	What materials and technologies can be effectively utilized to design and construct sustainable architectural habitats on Mars, considering the unique environmental challenges and the need for long-term human habitation?"
3	Scope and limit	Scope: Designing sustainable habitats for long-term human habitation on Mars, focusing on engineering challenges and solutions. Limit: Constrained by current knowledge, technology, and logistical constraints of space exploration; may not cover all aspects of habitat design.	Scope: Technological Innovations: Investigate advancements like Martian concrete and renewable energy systems designed for Mars colonization. Limits: Ethical Considerations: Highlight key ethical concerns related to environmental protection and resource utilization.	Scope: Reviewing Martian habitat designs and technological advancements for sustainable habitation. Examining the role of 3D-printing technology in Martian habitat construction. Limitations: Focusing on existing literature and conceptual designs. Excluding speculative or futuristic scenarios. Not discussing sociopolitical or ethical implications.	Scope: Investigating architectural designs and construction methods for Mars habitats. Exploring advanced technologies like 3D printing and robotics. Limits: Focus on proposed designs, not implemented structures. Constraints of current technology and resources. Exclusion of broader implications. Acknowledgment of uncertainties and risks.	Scope: Exploration of bio-composite materials in extraterrestrial architecture. Analysis of one specific architectural design proposal for Mars colonization. Limitations: Focus exclusively on bio-composite materials. Selection of a single architectural design proposal for analysis.	Scope: This research explores materials and technologies for sustainable habitats on Mars, considering environmental challenges and long-term habitation. It examines regolith, composites, 3D printing, robotics, and discusses case studies, challenges, and potential terrestrial applications. .

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4	How and where data is collected (Methodology & Methods/ Tools)	Data collection involves literature review, theoretical analysis, and expert consultation. Tools include academic databases, scientific journals, and publications from space agencies like NASA.	Remote Sensing: Utilize satellite imagery for Martian surface and atmospheric observations. Rovers and Landers: Deploy robotic missions for on-site data collection. Laboratory Experiments: Conduct controlled simulations to study material behavior and human physiology.	Literature Review: Utilize academic journals, conference proceedings, and NASA's website. Search databases like IEEE Xplore and Google Scholar. Interviews: Conduct interviews with experts in Martian habitat design. Collaboration: Partner with research institutions and companies involved in space exploration.	Literature Review: Reviewing existing research on Mars habitat design. Using academic databases and journals for information. Expert Interviews: Conducting interviews with professionals in relevant fields. Simulation and Modeling: Using computer simulations and VR/AR technologies.	Literature Review: Review scientific literature on bio-composite materials in extraterrestrial architecture. Utilize databases like PubMed and Google Scholar for relevant studies. Expert Interviews: Conduct interviews with experts in material science and architecture. Utilize semi-structured interviews for in-depth insights.	Literature Review: Gathering data from academic papers, research articles, and technical reports using online databases like IEEE Xplore, PubMed, Google Scholar, and NASA Technical Reports Server. Interviews and Consultation: Conducting interviews with experts in aerospace engineering, architecture, materials science, and robotics. Seeking consultation from researchers involved in Martian habitat projects.
5	Titles and subtitles used for Data collection	Title: Data Collection for Mars Habitat Design Subtitles: Literature Review Theoretical Analysis Expert Consultation	Title: Data Collection Methods for Mars Exploration Subtitles: Remote Sensing Techniques Robotic Missions: Rovers and Landers Controlled Laboratory Experiments	Title: Data Collection Methods for Martian Habitat Designs Subtitles: Literature Review: Gathering Insights from Academic Sources and Official Websites Expert Interviews: Extracting Knowledge from Martian Habitat Design Specialists Collaborative Efforts: Partnering with Space Exploration Entities for Comprehensive Data Gathering	Title: Data Collection Methods for Mars Habitat Research Subtitles: Literature Review: Reviewing Existing Research on Mars Habitat Design Utilizing Academic Databases and Journals Expert Interviews: Gathering Insights from Professionals in Relevant Fields Simulation and Modeling: Employing Computer Simulations and VR/AR Technologies	Title: Data Collection for Extraterrestrial Architecture Research Literature Review: Subtitle: Reviewing Scientific Literature Expert Interviews: Subtitle: Gathering Insights Data Analysis: Subtitle: Thematic Exploration Subtitle: Statistical Analysis	Title: Data Collection Methods for Research on Materials and Technologies for Martian Habitats Subtitles: Literature Review: Gathering Insights from Existing Research Interviews and Consultation: Engaging with Expert Perspectives Case Studies: Analyzing Existing Martian Habitat Projects

Name of the Student: Vedadnya Vakil							
	Data Collection and Analysis Matrix						
Sr No	Research Paper	Research Paper 1	Research Paper 2	Research Paper 3	Research Paper 4	Research Paper 5	Inferences for my research topic
6	Titles and subtitles used for Data Analysis	Title: Data Analysis for Mars Habitat Design Subtitles: Literature Review Findings Theoretical Analysis Results Expert Insights Integration	Titles and subtitles used for Data Analysis: Title: Analytical Methods for Mars Data Subtitles: Statistical Analysis Techniques Computational Modeling and Simulation Geographic Information Systems (GIS) Applications	Title: Data Analysis of Martian Habitat Designs Subtitles: Literature Synthesis: Integrating Insights from Academic Research and Official Reports Expert Perspectives: Analyzing Interviews with Martian Habitat Design Specialists Collaborative Insights: Extracting Key Findings from Partnership Endeavors	Title: Data Analysis for Mars Habitat Research Subtitles: Statistical Analysis: Analyzing Quantitative Data Conducting Descriptive and Inferential Statistics Qualitative Analysis: Examining Interview Transcripts Coding Qualitative Data Comparative Analysis: Contrasting Design Approaches Comparing Case Studies	Title: Data Analysis for Extraterrestrial Architecture Research Qualitative Analysis: Subtitle: Thematic Exploration Quantitative Analysis: Subtitle: Statistical Examination	Title: Data Analysis Methods for Research on Materials and Technologies for Martian Habitats Subtitles: Comparative Analysis of Literature Findings Expert Perspectives Synthesis Project Case Studies: Lessons Learned and Trends Identified
7	Types of graphical representations	Photos , Detail sections and other drawings and tables	Photos , Graphs and bar charts and tables.				
8	Conclusions and wayforward	Conclusions: Feasibility of sustainable habitat design for Mars. Addressing engineering challenges essential. Interdisciplinary collaboration crucial. Way Forward: Research on advanced materials. Develop life support systems. International cooperation for funding and missions. Test and refine habitat prototypes. Engage public support for space exploration.	Conclusion: Feasibility and Challenges: Mars colonization faces hurdles like radiation exposure, but technological advancements offer solutions. Multidisciplinary Approach: Success hinges on integrating engineering, science, psychology, and ethics. Resource Utilization: Using Martian resources is vital for sustainability and reducing reliance on Earth. Way Forward: Technological Advancements: Focus on developing technologies for radiation shielding and life support. International Collaboration:	Conclusions: Martian habitat designs vary, from conceptual models to practical solutions. 3D-printing technology is crucial for sustainable habitat construction. Collaboration among space agencies, institutions, and experts is vital for progress. Way Forward: Research refinement and validation through simulations and testing. Continued collaboration and partnerships for resource exchange. Implementation through pilot projects and missions to advance human exploration of Mars	Conclusions: Mars habitat research has progressed, emphasizing sustainable and habitable designs. Insights highlight challenges and opportunities in design and resource utilization. Collaboration and advanced technologies are key for overcoming Mars' environmental obstacles. Way Forward: Refine designs and methods through continued research and collaboration. Validate designs with simulations and prototypes. Explore new technologies and materials for Mars habitats. Aim for sustainable, long-term human presence on Mars.	Conclusions: Bio-composite materials offer promise for extraterrestrial architecture. Expert insights and thematic analysis highlight key considerations. Statistical analysis identifies trends among professionals. Way Forward: Refine bio-composite materials for Mars-specific applications. Foster collaboration for innovative construction techniques. Explore experimental testing and simulation studies. Integrate findings into ongoing Mars habitat design projects.	Conclusions: Promising Materials and Technologies: Regolith-based composites, additive manufacturing, and robotics show promise for Martian habitats, leveraging local resources and ensuring structural integrity. Way Forward: Prototype Validation: Developing functional prototypes will validate concepts and demonstrate the feasibility of materials and technologies in real-world scenarios.

Exploring Mendeley Reference Manager

- Aim of the exercise: To familiarize students with the functionalities and benefits of Mendeley Reference Manager specifically tailored for research in architecture.
- Designed for: Analytical learners, Visual and Auditory learners
- Method adopted and duration: Installing Mendeley Reference Manager, Mendeley Cite and Web Importer, exploring it to manage and insert references and create a database.
- Expectations from Students: Using the Mendeley Reference Manager to insert references/ bibliography of 10 papers relevant to their own research question.
- Format for Output: Word document with references/ bibliography inserted, consisting of 10 papers relevant to their own research question.
- Summary with basic observations: This helped students in understanding the comprehensive use of Mendeley Reference Manager, emphasizing its role in managing and citing research sources. Students gained practical skills such as importing references, organizing libraries, and generating citations and bibliographies in the context of architectural research.
- Example of a good work:

CITATION

- AI system architecture design methodology based on IMO (Input-AI Model-Output) structure for successful AI adoption in organizations(Park et al., 2024)
- The Impact of Artificial intelligence on the future of architecture & architects (The Revolution of Artificial Intelligence)(Agha, n.d.)
- Towards human-centered artificial intelligence (AI) in architecture, engineering, and construction (AEC) industry (Nabizadeh Rafsanjani & Nabizadeh, 2023)
- Degree project in The Build Environment Second cycle, 30 credits Artificial Intelligence in Architecture and its Impact on Design Creativity A Study on how Artificial Intelligence Affect Creativity in the Design Process(Borglund, n.d.)
- A systematic review on artificial intelligence applications in architecture(Bölek et al., 2023)

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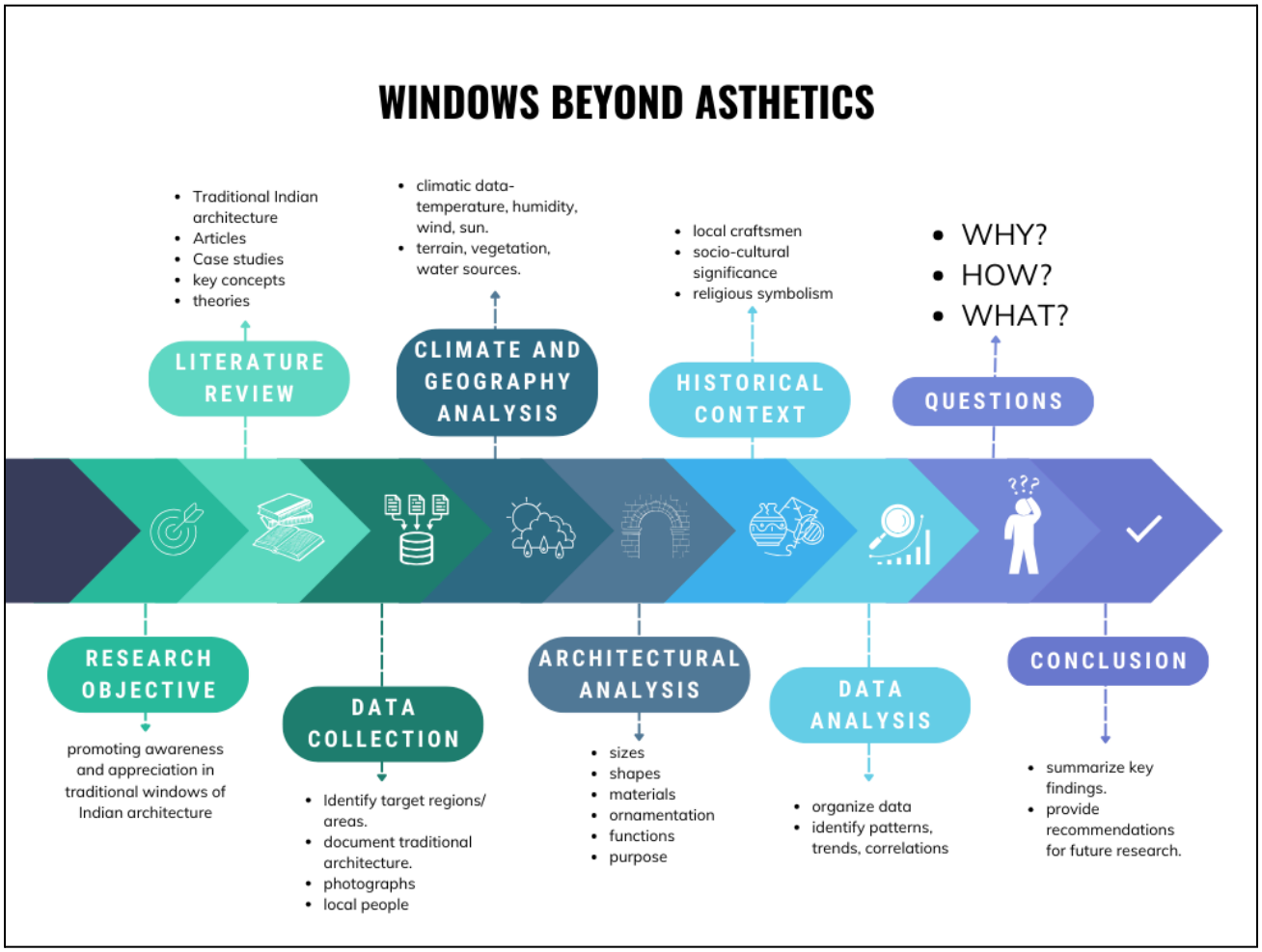
- Bölek, B., Tutal, O., & Özbaşaran, H. (2023). A systematic review on artificial intelligence applications in architecture. *Journal of Design for Resilience in Architecture and Planning*, *4*(1), 91–104. https://doi.org/10.47818/drarch.2023.v4i1085
- Borglund, C. (n.d.). *Degree project in The Build Environment Second cycle, 30 credits Artificial Intelligence in Architecture and its Impact on Design Creativity A Study on how Artificial Intelligence Affect Creativity in the Design Process*.
- Nabizadeh Rafsanjani, H., & Nabizadeh, A. H. (2023). Towards human-centered artificial intelligence (AI) in architecture, engineering, and construction (AEC) industry. In *Computers in Human Behavior Reports* (Vol. 11). Elsevier B.V. https://doi.org/10.1016/j.chbr.2023.100319
- Park, S., Lee, J. yoon, & Lee, J. (2024). AI system architecture design methodology based on IMO (Input-AI Model-Output) structure for successful AI adoption in organizations. *Data & Knowledge Engineering*, 102264. https://doi.org/10.1016/j.datak.2023.102264

Research Methodology Design

- Aim of the exercise: To come up with own chart of research methodology design
- Designed for: Analytical learners, Visual and Auditory learners
- Method adopted and duration: PPT and case study of faculty's own methodology design
- Expectations from Students: Design own methodology flowchart
- Format for Output: PPT presentation, Print submission
- Summary with basic observations: Intense discussion and thoughts were put forth, finalizing flow chart to specific topics
- Example of a good work:



Finalizing Research Titles:

Students put up their tentative/ proposed topics in the form of notes. This was followed by a group discussion with faculty members and their classmates, to interpret the titles and tweak/ edit them.

RIA I _ 2023-24 Faculty - Dr. Vaidehi Lavand, Ar. Rasika Apte			
Third Year, YELLOW Batch		**Third Year, RED Batch**	
Roll no	**Student Name**	**Roll no**	**Student Name**
Y1	AGRAWAL ANSH	**R1**	AGARE SANIKA
Y2	AGRAWAL YASH	**R2**	AGRAWAL SHUBHAM
Y3	AGRAWAL JANVI	**R3**	AGRAWAL SAKSHI
Y4	BADLANI RISHI	**R4**	AGRAWAL HARSH
Y5	BHALGAT VIDHI	**R5**	ANJANKAR SHANTANU
Y6	BHUTADA PALAK	**R6**	BAGUL SHRUTI
Y7	BOBADE ANOUSHKA	**R7**	BHOSALE KUSUMITA
Y8	BOTHE MEERA	**R8**	BORADE SHARVARI
Y9	DESHPANDE HRISHABH	**R9**	BORUDE TANUSHKA
Y10	DHOOT MADHURA	**R10**	DESHMUKH VIRAJ
Y11	GAKHARE ANIKET	**R11**	DESHPANDE AARYA
Y12	GHODAKE SAMARTH	**R12**	GHONE TANMAY
Y13	HARAPLE HARSHAL	**R13**	GUPTA ASHWINI
Y14	JADHAV SANSKRUTI	**R14**	INGOLE PRIYAL
Y15	JADHAV ANUSHKA	**R15**	JADHAO SWRAJ
Y16	JAMDAR TEJAS	**R16**	KALEKAR SAYLI
Y17	JONATHON	**R17**	KAPADE GIRIDHAR
Y18	KHAN SAEEM	**R18**	KINGER KOYAL
Y19	KHANAJ VAISHNAVI	**R19**	KULKARNI VEDASHRI
Y20	KULAT HARSHADA	**R20**	KHUSHI SENTHIL
Y21	MAHAJAN SAKSHI	**R21**	MANDALAPURE VEDANT
Y22	MANE SATYAM	**R22**	MATHAPATI YASH
Y23	MATHEKAR ASHUTOSH	**R23**	MEMANE KAUSHAL
Y24	MUNDADA RAMESHWAR	**R24**	MUNGILWAR VYANKATESH
Y25	NAHAR SAMIKSHA	**R25**	NAIK HARSH

Y26	PATIL SHRAVANI	**R26**	PADALKAR SHRAWAN
Y27	POL VIVEK	**R27**	PATARE YASHASVINI
Y28	PUKALE VAISHNAVI	**R28**	PATIL CHIRANTAN
Y29	RANGASWAMY NITSH	**R29**	RATHOD LIPAKSHI
Y30	RATHI VAIBHAVI	**R30**	RUIKAR YASH
Y31	RAVAL TANISHKA	**R31**	SALAVE SANIYA
Y32	SONTAKKE ISHA	**R32**	SAUDAGAR MITALI
Y33	TAWARE SAI	**R33**	SINGH SONALI
Y34	THANGE GAURI	**R34**	SONMALI SHRAVANI
Y35	THOMBRE MIHIR	**R35**	SUTAR YASHASHRI
Y36	TOSNIWAL PUSHKARRAJ	**R36**	TOTADE MIHIKA
Y37	YADAV SHRUTI	**R37**	VAKIL VEDADNYA
Y38	ZAMBRE SAI	**R38**	WAGH ARWA
Y39	CHAUDHARI ADITI	**R39**	WAGHMODE DNYANESHWAR
Y40	JAGTAP ADITYA	**R40**	YADAV ANURADHA
		R41	GAPAT DIVYA
		R42	MARASHAH UMMEHANI