



GUJARAT TECHNOLOGICAL UNIVERSITY

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Graduated School of Engineering and Technology

Nr. Visat crossing, Visat-Gandhinagar Highway, Chandkheda, Ahmedabad, Gujarat

REPORT

On

AICTE Training and Learning Academy (ATAL)

sponsored

Faculty Development Program on

“ADVANCES IN EARTHQUAKE ENGINEERING AND STRUCTURAL RESILIENCE”

(From 16th October to 21st October, 2023)



Graduated School of Engineering and Technology has organized AICTE Training & Learning Academy (ATAL) sponsored Faculty Development Program (FDP) on “Advances in Earthquake Engineering and Structural Resilience” from 16th Oct. 2023 to 21st Oct. 2023. This FDP received an overwhelming response with 50 participants from different AICTE-recognized technical institutes of Gujarat.

Day 1: 16th Oct. 2023

Inaugural Program:

The inaugural session of the Faculty Development Program was started at 9:30 AM on 16th October 2023 in presence of **Dr Rajul Gajjar**, Vice-Chancellor of GTU, **Dr K. N. Kher**, Registrar of GTU, **Dr S. D. Panchal**, Director of GTU-GSET, **Dr Vatsal Patel**, Chief Guest of Program, **Dr Dhiman Basu**, Guest of Honor, **Dr. J.A. Amin**, Professor, GTU-GSET and Coordinator of ATAL FDP, **Prof.. Mridul Seth**, Assistant Professor, GTU-GSET and Co-coordinator of ATAL FDP and Participants of ALTAL FDP.

As moderator of the inaugural ceremony **Prof. Rutika Ghariya**, Assistant Professor, GTU-GSET, welcomed all the dignitaries and delegates. She started the event as per the program schedule of the inaugural session. The session started with lamp lighting. After that, all the dignitaries were felicitated with tokens of love by other dignitaries.

Dr. S. D. Panchal, Director of GTU-GSET, extended a warm welcome to all the dignitaries and participants. He welcomed the chief guest, faculty, and other participants. In his speech, he thanked AICTE for



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sponsoring this FDP and expressed his wishes to all the participants to enhance their skill set and to transform the same knowledge to the students to do their works, projects, etc. He gave a speech about the program and highlighted the importance of the FDP. He also shed light on the topic of the program and finally concluded with a thanking speech.

Guest of Honor, Dr. Dhiman Basu, Associate Professor of IIT Gandhinagar, greeted all the participants. and gave a speech related to the program topic and highlighted some important points related to design of earthquake-resistant structures, role of structural engineers in the earthquake field, importance of upgrading technical skills of faculty members, research scholars, and PG students. He concluded his speech by giving thanking to all and organizing committee for inviting him as a guest of honor.

The Chief Guest, Dr Vatsal Patel, Director, Setu Infrastructure, Ahmedabad gave a speech and talked about sustainable and quality construction. He was a part of the Sabarmati and Riverfront development program. He also gave some information about the future urban development of Gujarat in the next 15 years. The speech focused on the importance of urban development in the context of natural disasters. In the end, sir told us that this will be an upcoming thrust area and to use this opportunity by every participant.

Dr. Rajul Gajjar, Vice-Chancellor of GTU, in her speech highlighted some points related to the program topic. She highlighted the role and responsibilities of civil engineers in mitigating effects of natural disasters like earthquakes and making safe and reliable infrastructures for the community. In her speech, she gave some future direction that the next generation of structure engineers must decide where we are, how we can built the seismic resilience structures. At the end, she congratulates the organizing team of FDP for choosing the right topic.

Finally, **Prof. Mridul Seth**, Assistant Professor of GTU-GSET, gave a vote of thanks for all the dignitaries, participants, AICTE and GTU.





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Pic 1: Inauguration Ceremony photographs of ATAL FDP



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DAY- 01: 16th October, 2023 - 10:00 AM to 12.30 PM

Session-01: Seismic Load and Analysis as per IS-1893

Resource Person: Dr. Dhiman Basu, Dept. of Civil Engg., Associate Professor, IIT Gandhinagar

- ✧ **Dr. Dhiman Basu** covered three important aspects of seismic Engineering during his session, i.e. Basics seismology including definitions and explanation of Earth's core, Basics of structural Dynamic and seismic load assessment & analysis as per IS-1893 provisions with guided examples.
- ✧ Dr. Basu explained the fundamentals of seismology, characteristics, of seismic waves, duration and frequency of earthquakes, instruments used to measure seismic activity, such as seismographs and seismograms, concepts of Peak Ground Acceleration (PGA) and hazard graphs, providing a solid foundation for the subsequent topics.
- ✧ Moving on to the second topic, the basics of dynamic analysis and response spectra were elucidated. Dr. Basu used practical examples, including pendulum dynamics, to illustrate key concepts. Detailed explanations were provided on time-stepping methods, displacement response history, and various aspects of dynamic analysis. This part of the course effectively addressed common doubts and queries raised by fellow faculty members and students.
- ✧ Dr. Basu also explained the basics of the seismic analysis and design of structures according to IS-1893, a crucial topic in today's engineering landscape through various examples. This comprehensive coverage equipped the audience with a deep understanding of seismic design principles and practices, enabling them to apply this knowledge effectively in their engineering endeavors.

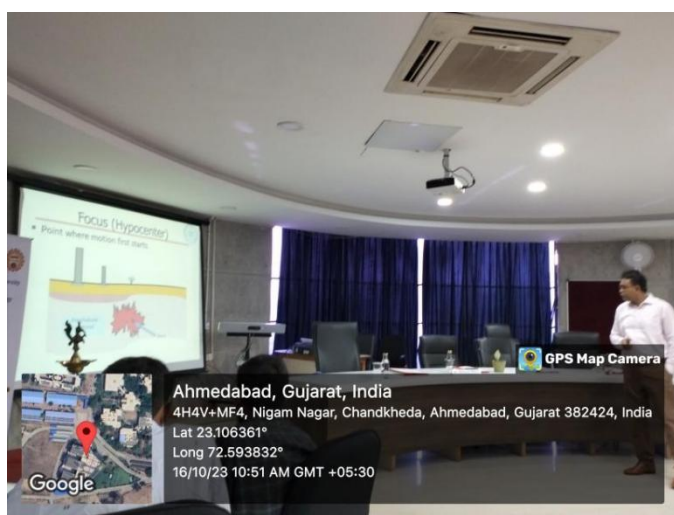


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Pic-2: Prof. (Dr.) Dhiman Basu taking a session on “Seismic load and analysis as per IS 1893”



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Session-02 (2.30 PM TO 5.0 PM): Recent Trend in Remedial Engineering & Structural Retrofitting

Resource Person: Kaizaad Engineer (Director, Ushta Infinity, Vadoadara)

- ❖ **Er. Kaizaad Engineer, Professional structural engineer** with extensive experience in the field of retrofitting and maintenance of structures, delivered an enlightening session that left a lasting impact on the participants. Through a series of case studies, Dr Engineer shared valuable insights into the remedies and techniques employed to enhance the robustness of existing structures. His practical experience of nearly 25 years in retrofitting and maintaining various types of structures, including chimneys, heritage structures, bridges, and reinforced concrete (RC) frames, provided a rich source of knowledge for the audience.
- ❖ Several case studies were presented during the session, exemplifying the diverse challenges and solutions in retrofitting. These included the retrofitting of a cement silo in a cement plant, where techniques such as grouting, reinforcement, and stitching were employed to improve its condition, all while maintaining 40% of its working capacity..
- ❖ One of the highlights of the session was a discussion on the renovation and strengthening of the iconic Town Hall in Kolkata, a historic structure dating back to the 1800s. Er. Kaizaad shared the challenges they faced in restoring and strengthening the Town Hall, including interactions with local stakeholders and the innovative use of helical bars in the retrofitting process.
- ❖ The session also covered the retrofitting technique used for jetty bridge project, RC chimney and bridge structures. His comprehensive presentation provided a wealth of knowledge and inspired a new generation of engineers to explore and contribute to the field of retrofitting and maintenance in the modern era.



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Pic-3: Er Kaizaad Engineer explaining various retrofitting techniques



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LAB/Practical Session-01 :

Use of a tomography device to detect the voids and strength of the concrete

Delivered by: Kaizaad Engineer and Team (Ushta Infinity, Vadodara)

✧ The practical session on tomography instruments for concrete inspection was conducted by Mr. Kaizaad Engineer and his technical team. Participants had the opportunity to delve into the world of tomography, gaining hands-on experience with a portable instrument capable of sending and receiving ultrasonic pulses. Under the guidance of Dr Kaizaad and his team, attendees not only comprehended the principles and operation of the instrument but also learned how to effectively detect voids in concrete and assess the strengths and weaknesses of Reinforced Concrete structures.



Pic-4: Practical session of Tomography instrument



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DAY- 02: 17th October, 2023

Session-03: Earthquake Resistance Design in Steel Structures

Resource Person: Mr. Bhavin Shah, Founder & CEO, SQVe Consultants, Ahmedabad

- ✧ **Mr. Bhavin Shah's** session on "Earthquake Resistance Design of Steel Structures" was an enlightening experience. He commenced the session by drawing upon his rich career experiences, offering real-world insights into the importance of earthquake-resistant steel structure design. His practical anecdotes resonated with the audience, setting the stage for a thorough understanding of seismic design principles.
- ✧ As the session progressed, Bhavin Shah meticulously delved into the critical parameters and noteworthy clauses governing earthquake-resistant design, paying particular attention to the intricacies of Section 12 of IS 800:2007. He highlighted that while IS 800 provides essential guidelines, it has certain limitations in practical applications, which he discussed in detail. The advent of IS 18168-2023 was another focal point in his presentation, as he expounded upon the updates and the implications for engineers and designers. A captivating aspect of the session was the insightful discussion regarding the conflicts and potential overlaps between IS 800 and IS 18168, which sparked engaging conversations and deeper understandings among the participants.
- ✧ As the session drew to a close, attendees, comprising both faculty and students, actively engaged with Engineer Shah in a Q&A session. Queries ranged from the practical aspects of buckling analysis within commercially available software, elucidating the complexities of gusset plate design based on Section 12 of IS 800, to determine which connection method, be it bolts or welding, exhibited superior ductility and suitability in various scenarios. Bhavin Shah's extensive knowledge and the interactive rogue with the audience made the session a valuable exploration of earthquake-resistant steel structure



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design, addressing both theoretical and practical aspects of seismic design in steel structures.



Pic-5: Er. Bhavin Shah addressing participants in session 03



Session - 04: Application of Seismic Base Isolation to Buildings and Bridges

Resource Person: Dr. D. P. Soni, Professor, Civil Engineering Dept., SVIT, Vasad

- ✧ Dr. Soni began the session by imparting essential terminology related to seismology, structural dynamics, and, notably, the concept of damping. Participants gained a solid foundation in these fundamental aspects, which set the stage for a deeper exploration of base isolation systems. He explained the key behaviour of various control systems, including passive, active, hybrid, and semi-hybrid systems, shedding light on their unique characteristics.
- ✧ The highlight of the session was the detailed presentation of behaviour or of base isolation systems. Dr. Soni illustrated the principles with an example of a single-degree-of-freedom system, making complex concepts accessible to all participants.
- ✧ In the final segment of the session, Dr. Soni showcased the practical applications of base isolation systems through various case studies. These case studies were particularly relevant, addressing challenges such as the asymmetry of buildings in both plan and elevation, highlighting the versatility and adaptability of these systems.



Pic-6: Visual Highlights of the session-04 deliver by Dr. D. P. Soni



LAB/Practical Session - Day 02

Schmidt Rebound Hammer Test for checking the quality of existing RC structures

Driven by: Kaushik Gondaliya (Ph.D. Scholar, SVNIT, Surat)

- ✧ During the session, participants carried out the Schmidt Rebound Hammer Test, a crucial non-destructive testing method used for qualitative strength assessment of existing Reinforced Concrete (RC) structures. This test holds significant relevance in assessing the structural integrity of RC components and identifying areas of potential weaknesses. The participants conducted the test on the RC wall of A-0 Hall at GTU and recorded readings with precision.
- ✧ The session also included a detailed explanation by the faculty on the fundamental principles of the Schmidt Rebound Hammer Test. This hands-on experience and theoretical understanding provided a valuable foundation for the students, enabling them to contribute effectively to the assessment and maintenance of RC structures in the future.



Pic- 7: Practical Session of NDT Schmidt Rebound hammer test



Day - 03: 18th October, 2023

Session - 05: Vibration control of structures using energy dissipation devices

Resource Person: Dr. Snehal Mevada, Assistant Professor, Dept. of Structural Engg, BVM, V. V. Nagar

- ❖ **Dr. Snehal Mevada** delivered an insightful expert session on "Vibration Control of Structures Using Energy Dissipation Devices." The session commenced with an in-depth exploration of the classification of structural control systems, which encompassed passive, active, semi-active, hybrid control systems and comprehensive breakdown of each classification, elucidating their underlying mechanics, applications, as well as their respective advantages and disadvantages. Furthermore, he shed light on recent developments in the realm of structural damping systems, including MR (Magnetorheological) dampers, ER (Electrorheological) dampers, and Controllable Fluid Dampers. Dr. Mevada supplemented his lecture with numerical case studies involving a 1 and 4-storey asymmetric building. These case studies delved into the mathematical modelling of linear and non-linear dampers, offering valuable insights into their behaviour and effectiveness. Finally, Dr. Mevada discussed the fascinating concept of human behavior in the aftermath of earthquakes. He highlighted a cycle of heightened vigilance immediately after an earthquake and a gradual return to carelessness over an extended period.
- ❖ In a spirited exchange, faculty members and students posed questions related to mathematical modelling and MR dampers, seeking insights on how to determine the most suitable damper system for specific structures. Dr. Mevada's session proved to be an enlightening and thought-provoking exploration of structural vibration control, leaving the audience with a deeper understanding of this critical field



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Pic-08: Highlights of session - 05



Session - 06: Masonry Structures: Seismic Behavior, Assessment and Retrofitting

Resource Person: Dr. Sharad Purohit (Professor, Nirma University)

- ❖ **Dr. Sharad Purohit's** presentation commenced with an overview of major earthquakes that have shaken the world over the past few decades, setting the stage for a comprehensive exploration of masonry structures. Dr. Purohit delved into the historical context, elucidating both the advantages and disadvantages of masonry structures. He emphasized that masonry structures, while not immune to seismic forces, are inherently less vulnerable compared to RC structures. Using examples of masonry structures, he illustrated the causes of failure and factors contributing to stability during earthquakes.
- ❖ Moving forward, Dr. Purohit addressed the post-earthquake assessment of masonry structures, outlining a systematic approach involving visual screening methods, preliminary assessments, and detailed assessments. He then elaborated on various retrofitting strategies tailored to masonry structures, which included the use of wooden bents, reinforcing mesh, and fibre-reinforced polymers. Dr. Purohit also shared insights from shake table experimental studies conducted at Nirma University, focusing on masonry structures constructed with standard blocks, AAC blocks, masonry with wire mesh, and masonry with and without bents.
- ❖ Throughout the session, an active dialogue emerged as numerous questions surfaced from the engaged audience. Dr Purohit addressed queries on topics such as calculating damping for masonry structures and creating Finite Element (FE) models of masonry, difference between macro or micro FE modelling and the applicability of the equivalent frame method. Dr. Purohit's session provided a profound understanding of seismic considerations in masonry structures and offered practical insights into their assessment and retrofit, making it an invaluable learning experience for all participants.



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Pic - 09: Highlights from session - 06



LAB/Practical Session:

Carried by: Mr. Falak Vats, Ph.D. Scholar, IIT Gandhinagar

- ✧ **Mr. Falak Vats**, conducted a comprehensive laboratory session on Selection and Scaling of EQ ground motion and Time History Analysis using SAP2000. The session began with a crucial overview of Time History Analysis and its relevance in structural engineering. Mr Vats emphasized the critical role of reliable seismic data for this type of analysis, as it underpins the safety and stability of structures in regions prone to earthquakes.
- ✧ Participants were introduced to various data sources for earthquake time history data. In the context of Indian earthquakes, the session covered two key sources: PESMOS (Peak Earthquake Spectra of Motion) and COSMOS (California Strong Motion Instrumentation Program). PEER Ground Motion Database consist of extensive earthquake ground motion data of past major earthquakes occurred across the world. Participants learned how to navigate and extract relevant data to enhance their structural analysis capabilities.
- ✧ A significant part of the session was devoted to understanding the process of manual data acquisition. This method is essential for dealing with custom or obscure seismic events. Key steps include identifying the desired earthquake event, obtaining the ground motion data in digital format (often presented as acceleration-time histories), and thoroughly verifying the data for quality and compatibility with SAP2000.
- ✧ The session also explored two methods for uploading earthquake time history data into SAP2000. The first method involved manual input, where Mr. Vats demonstrated how to input the data manually into the software. This process includes entering time history values and ensuring correct units and scaling factors for accurate analysis. The second method, code-based input, was introduced as an efficient approach for handling extensive



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data or automating the input process. Mr. Vats explained how participants could use MATLAB or any other scripting or coding to streamline the upload of earthquake data into SAP2000. This not only saves time but also reduces the risk of errors when working with multiple ground motion records.

- ✧ Throughout the session, participants had the opportunity to engage in hands-on exercises, reinforcing their learning by accessing earthquake data, manually inputting data into SAP2000 for specific structural models, and employing code to automate data upload and analyze structural responses. This interactive and informative laboratory session had equipped the participants with essential knowledge and skills for Time History Analysis in SAP2000..



Pic - 10: Glimpse of Practical Session conducted by Mr. Falak Vats



Day - 04: 19th October, 2023

Industrial Visit: Institute of Seismological Research, Raysen- Gandhinagar.

- ✧ The Institute of Seismological Research (ISR), Government of Gujarat is a leading institution in seismological research and earthquake hazard mitigation.
- ✧ The visit began with a guided tour of the facility, showcasing state-of-the-art infrastructure, laboratories, and monitoring stations. The ISR working on the seismic micro-zonation, assessing seismic vulnerability, raising public awareness about earthquake preparedness and, dividing regions based on seismic hazard characteristics.
- ✧ In the Seismic Data Analysis Center (SeiDAC), we learned about earthquake fundamentals, fault lines, and monitoring using a network of seismographs and accelerographs. Real-time seismic data analysis and knowledge of earthquake waves and measuring units were shared.
- ✧ The Optically Stimulated Luminescence (OSL) Laboratory was an eye-opener. OSL dating is used to determine the age of geological materials, aiding earthquake research in assessing recurrence intervals and fault timing.
- ✧ The Geotechnical Laboratory consists of advanced equipment for conducting tests on soil and rock samples to predict settlement and behaviour during earthquakes. The ISR's commitment to earthquake hazard mitigation and public outreach is commendable, contributing to a more resilient society.
- ✧ In summary, visit to ISR provided a comprehensive understanding of seismology and earthquake engineering, highlighting the institute's pivotal role in advancing earthquake research and safety measures.



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Pic - 11: Visit to the ISR, Gandhinagar



Session-07: Importance of experiments in Dynamics, Codal Provisions and Assessments

Resource Person: Dr. C. S. Sanghavi, Applied mechanics Dept., Professor, LDCE, Ahmedabad

- ❖ **Dr. Sanghavi** initiated the session by drawing a clear distinction between gravity loads and seismic loads, supporting his explanations with real-life examples that vividly illustrated the fundamental differences. He emphasized the unpredictable and hazardous nature of seismic events, underscoring the need for robust seismic design and preparedness.
- ❖ One of the highlights of the session was Dr. Sanghavi's use of physical models to explain the concepts of frequency, fundamental natural time period of system, using SDOF system models with different masses, stiffness, and lengths. These demonstrations and some shake table experimental data helped participants grasp the intricacies of structural dynamics and earthquake engineering.
- ❖ He delved into the importance of earthquake-resistant design for structures, providing valuable insights into designing for seismic resilience. He complemented his teachings with video-graphic representations of Single Degree of Freedom (SDOF) systems, elucidating the significance of addressing horizontal irregularities, vertical irregularities, and the soft and weak storey concept in structural design. The inclusion of case studies from past earthquakes worldwide further enriched the learning experience, offering real-world perspectives on seismic challenges and solutions.
- ❖ Dr. Sanghavi also provided a simplified yet comprehensive explanation of ductility and the strong column-weak beam principle, which are essential in earthquake-resistant structural design. The clarity and depth of his explanations left participants with a profound understanding of seismic design principles and their practical applications.



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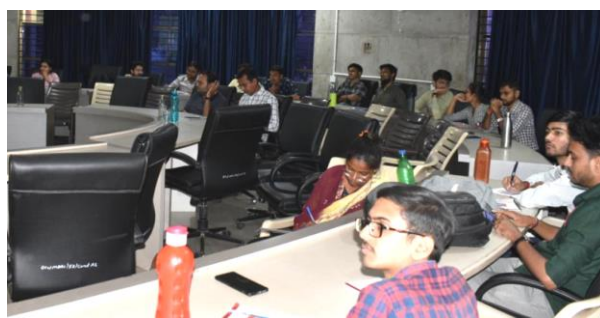
Pic-12: Lecture Driven by Dr. C. S. Sanghavi sir on ‘Seismic codal provisions and assessment’



LAB/Practical Session- 04:

Driven by: Mr Narsiram Gurjar, Ph.D. Scholar, IIT Gandhinagar

- ✧ **Mr. Narsiram Gurjar** took a very attentive session on Torsional irregularity, a critical aspect of structural engineering, which was the focus of a recent practical session, with an emphasis on simulation using SAP2000. This report highlights the key takeaways from the session, shedding light on the concept, analysis, and advanced applications. Torsional irregularities in building structures arise when there's an uneven distribution of mass or stiffness along the height of a structure, potentially leading to complex responses during seismic events.
- ✧ In this session, we explored how SAP2000, a robust finite element analysis software, can be employed to address these irregularities. The session began by creating a 3D structural model, accurately representing the building's geometry, materials, sections, and supports. Seismic loads were applied, adhering to relevant building codes, and dynamic analysis was conducted. The results provided valuable insights into structural behaviour, especially focusing on torsional effects and their implications.
- ✧ Furthermore, the session delved into advanced analysis techniques, such as modal analysis to identify torsional modes, time history analysis for in-depth dynamic assessments, and pushover analysis to determine capacity curves and understand plastic hinge development using SAP2000 software.



Pic - 13: LAB session on Torsional irregularity



Day - 05: 20th October, 2023

Session - 08: Research Methodology and Recent Advances in Concrete Materials in Earthquake Engineering

Resource Person: Dr. C. D. Modhera, Professor, SVNIT, Surat

- ❖ **Dr. Modhera** delivered a thought-provoking session on "Recent Advances in Concrete Materials in Earthquake Engineering," beginning with a fascinating analogy between concrete and the human body. Drawing parallels, he highlighted how concrete, like the human body, requires essential components, care, and protection from tension. He proceeded to elucidate the fundamental constituents of concrete, delving into their physical and chemical properties. Dr. Modhera also provided a comprehensive overview of emerging trends in concrete materials, including fly ash, silica fume, blast furnace slags, and others, discussing their sub-classifications, applications, and the advantages and disadvantages associated with each.
- ❖ Expanding on the topic, he introduced various types of concrete, such as Ultra High-Performance Concrete, Geopolymer Concrete, Sulphate-Resistant Concrete, Self-Compacting Concrete, and Self-Repairable Cement. Each of these concrete types was explained in detail, shedding light on their characteristics and applications. Dr. Modhera concluded the session by offering a glimpse into the future of concrete technology, emphasizing areas of research like life cycle assessment, sustainability, resilience, carbon credits, and green ratings.
- ❖ As the session progressed, intriguing questions arose from the audience, particularly regarding the utilization of high-volume fly ash concrete and geopolymer concrete. Dr. Modhera addressed these queries satisfactorily, enriching the discussion and leaving the participants with a deeper understanding of the evolving landscape of concrete materials



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in earthquake engineering.



Pic - 14: Highlights of Session - 08



Session - 09: Seismic Risk and damage Assessment of RC Frame Building stocks in Surat city

Resource Person: Dr. S. A. Vasanwala, Professor, SVNIT, Surat

Dr. Vasanwala delivered an enlightening lecture on the topic of “Seismic Risk and damage Assessment of RC Frame Building stocks in Surat city.” At the outset, he introduced the concept of fragility, defining it as the quality of being susceptible to damage or breakage. Dr. Vasanwala then delved into various seismic performance assessments as part of fragility analysis, with a particular emphasis on the vulnerability aspect. He proceeded to explain multiple approaches for conducting fragility analysis, including the non-linear pushover analysis, incremental dynamic analysis, and probabilistic seismic vulnerability.

- ❖ To illustrate these concepts in practice, Dr. Vasanwala offered a detailed example of a 4-storey RC frame structure, examining different configurations while comparing the analysis approaches within SAP 2000 software. His conclusions were illuminating, indicating that the probabilistic approach yields higher accuracy, albeit being less practical for larger structures due to the extensive number of ground accelerations involved. He recommended employing incremental dynamic analysis for large building structures, as it provides more precise results than non-linear pushover analysis.
- ❖ As the discussion came to a close, participants engaged with Dr Vasanwala, posing questions related to various analysis procedures, further enriching the session and facilitating a deeper understanding of seismic risk assessment in the context of RC frame buildings.



Pic - 15: Highlights of Session - 09



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LAB Session:

Carried by: Mr. Kaushik Gondaliya (SVNIT, Surat)

- ✧ **Mr. Kaushik**, conducted an informative lab session on the intriguing topic of "Hands on demonstration on OAPI features of SAP2000." His session was an extension of Dr. S. A. Vasanwala's lecture, and it commenced with a detailed introduction to various types of datasets pertinent to coding applications like Python and MATLAB. Mr. Gondaliya highlighted Python's prominence in data analysis, underlining how it can be effectively utilized even with minimal prior knowledge. He further emphasized Python's capability to run and interact with software like SAP2000, making it a versatile tool for structural engineering tasks.
- ✧ In the practical implementation phase, Mr. Gondaliya demonstrated a basic programming example that could open SAP2000 and execute various modelling and analysis functions. He pointed out that commercial software like SAP, ETAB and Staad.pro and Midas have dedicated libraries for dataset integration, simplifying the process. Participants, particularly PG students, found the session highly enlightening, as it provided valuable insights into the integration of coding and structural analysis tools.
- ✧ Mr. Gondaliya concluded the session by discussing the promising prospects of Artificial Intelligence (AI) in the field of structural engineering, shedding light on the exciting possibilities that lie ahead. His session was a resounding success, contributing to the participants' knowledge and inspiring them with the potential of AI in the structural engineering domain.



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Pic - 16: LAB session on Python-SAP2000 integration



Day -06: 21st October, 2021

Session 10: Structural Resilience and Enhancing performance of structures-role of seismic isolation

Resource Person: Dr. Manish Kumar, Associate Professor, Dept. of Civil Engg., IIT Gandhinagar

- ❖ **Dr. Manish Kumar** delivered a comprehensive lecture on “Structural Resilience and enhancing performance of structures-role of seismic isolation,” which spanned a diverse range of topics and left the audience enriched and engaged. Beginning with an overview of the concepts to be covered, including confined masonry structures, seismic isolation, power infrastructure resilience, and 3D concrete printing, Dr. Kumar proceeded to provide valuable insights into each area.
- ❖ In the discussion on masonry structures, he shared examples of heritage buildings that stood or fell during earthquakes, drawing attention to the development of the Quetta bond in masonry structures by Lal Kumar after the 1931 earthquake. He delved into the concept of confined masonry, highlighting its use in projects such as IIT Gandhinagar and comparing it with infilled RC frame structures. The audience's curiosity led to a discussion on the best analysis methods for assessing confined masonry behaviour during seismic events.
- ❖ Shifting to seismic isolation systems, Dr. Manish Kumar explored various types and properties, with a focus on the pendulum friction-bearing system. Using a practical example of a 6-story RC structure with and without isolation systems, he vividly illustrated the benefits of seismic isolation in reducing structural damage under different ground acceleration levels. He further touched upon the application of isolation systems in nuclear power stations, outlining the critical considerations and remarkable results



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achieved by his team in this context.

- ✧ Dr. Manish Kumar then delved into the resilience of transmission line towers, highlighting the challenges posed by cyclonic effects in coastal areas and the various prioritization methods for tower placement. He discussed innovative tower configurations and detailed the experimental and simulation analyses conducted using wind tunnel testing.
- ✧ The lecture concluded with an exploration of 3D-printed concrete, emphasizing its practicality and affordability in construction projects. He shared a notable example of a bunker built on the western border of India using 3D printing technology. During and after the lecture, numerous questions arose, ranging from the differences between 3D printing and precast segments in terms of construction speed and strength requirements to the best methods for designing isolators in software. Dr. Manish Kumar provided detailed and informative responses, contributing to a well-rounded and enriching session for all participants.



Pic - 17: Highlights of Session - 10



Topic: Discussion on Reflection Journal

Resource Person: Dr. J. A. Amin, Professor, GSET, Ahmedabad

- ❖ **Dr. J. A. Amin** provided a concise but vital talk on the integral component of the Continuous Comprehensive Assessment (CCA) for the AICTE Teaching and Learning (ATAL) Faculty Development Programme (FDP). He emphasized the importance of the reflective journal, which is to be maintained by all program participants. This journal serves as a repository for key takeaways from the ATAL FDP, as well as a platform to outline future teaching implementations based on the knowledge and skills acquired during the program. Additionally, Dr. Amin underlined the requirement for each participant to submit a Teaching Practice report, documenting the practical application of the program's topics within their specific domains. This report should also encompass insights into emerging trends and the practical application of ATAL FDP learnings.
- ❖ In his talk, Dr. Amin also shed light on the forthcoming MCQ (Multiple Choice Question) and short question exams that will serve as essential components of the ATAL FDP's assessment. These assessments will evaluate participants' grasp of the program's content and their ability to effectively apply this knowledge in their teaching practices. Dr. Amin's discussion provided a clear roadmap for the participants on how to document their learning journey and underscored the program's commitment to comprehensive assessment and professional development.



Pic - 18: Prof. J. A. Amin addressing participants regarding CCA



Article discussion/ Research papers:

1. Jignesh Amin, Kaushik Gondaliya, Chirag Mulchandani (2021) Assessment of seismic collapse probability of RC shaft supported tank, Structures, Elsevier, 33 (2), pp-2639-2658, DOI: [10.1016/j.istruc.2021.06.002](https://doi.org/10.1016/j.istruc.2021.06.002), ISSN: 2352-0124.
2. Kaushik M. Gondaliya, Jignesh Amin, Vishisht bhaiya, Sandip Vasanwala, Atul K. Desai (2023) Seismic vulnerability evaluation of code compliant RC frame buildings using fragility analysis, Journal of Vibration Engineering and Technologies, 11, pp-207-231, ISSN- 2523-3939, <https://doi.org/10.1007/s42417-022-00573-1>

Smooth Conduction of Exam and Feedback Session

- ✧ On the concluding day of the ATAL Faculty Development Program (FDP), a well-structured Comprehensive Continuous Assessment of cumulative 100 marks was conducted, adhering to the guidelines of the program. This Assessment was having the following criteria as:
- ✧ 25 MCQs along with 5 Short answer type questions worth a total of 30 marks, with each question carrying a 1-mark each. The weightage to the the assessment was given as 10% of total marks.
 - ✧ 20% weightage was given to attendance of the participants.
 - ✧ Participants were evaluated for their submission of 2 Page article summary/team for 30 % weightage.
 - ✧ Teaching practice reports were submitted by the participants and evaluated for 15% weightage.
 - ✧ Participants have also submitted the report of Industrial visit in team as a part of evaluation consist of 10% weightage.
 - ✧ Each participants as individual submitted a Reflective Journal in which they have mentioned about key learnings and objectives as a part of evaluation consist of 15% weightage.
 - ✧ We received the application from 69 participants among which 49 participants attended the event with more than 80 % attendance i.e. 100 % attendance.
 - ✧ All 49 participants have scored more than 70 % marks cumulative in the Comprehensive Continuous Assessment



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- ✧ Following to the examination, a feedback session was organized, inviting participants to share their experiences with the ATAL FDP. Several faculty members expressed their satisfaction, lauding the program as one of the best they had ever attended. They appreciated the program's holistic approach, with a particular focus on earthquake engineering, and commended the choice of expert speakers whose knowledge and insights greatly enriched the learning experience. On a closing note, the ATAL FDP came to an end with heartfelt thanks extended to all the participants by Prof. Mridul Seth, an Assistant Professor at GSET, signifying the successful completion of this valuable and impactful program.



Highlights of Valedictory and Feedback Session and concluding remarks



Group Photo at the end of ATAL FDP

ATAL FDP on “Advances in Earthquake Engineering and Structural Resilience” 16th Oct. 2023 to 21st Oct. 2023
Organized by Graduated School of Engineering and Technology.