



VIGNAN'S

INSTITUTE OF MANAGEMENT AND
TECHNOLOGY FOR WOMEN



Department of Information Technology

ITSPECTRUM

IT Newsletter | Issue : Oct - Dec, 2025 | Volume : 20

Vision of the Department

“To impart technical education producing competent and socially responsible engineering professionals in the field of Information Technology”.

Mission of the Department

- M1: To make the teaching–learning process more engaging, effective, and stimulating.
- M2: To impart strong foundational knowledge in sciences and information technology while fostering a positive attitude.
- M3: To create a conducive environment for developing skills and technologies aligned with industry needs.

Program Educational Objectives

- PEO1: Apply knowledge of mathematics and information technology to Analyze, design, and implement effective solutions for real-world problems in core as well as multidisciplinary domains.
- PEO2: Communicate effectively, work collaboratively in teams, uphold professional ethics, and leverage computing technologies for the betterment of society.
- PEO3: Pursue professional growth through lifelong learning, continuous skill enhancement, or higher education.

Program Specific Outcomes

- PSO1: Apply standard practices for software project development using hands-on programming skills for analysis, design and creation of software solutions.
- PSO2: Design networks and awareness of network security related issues.
- PSO3: Develop IT Application services with the help of different current engineering Tools.

Editorial Board

Mr Venkat Rao Ubbala

Assistant Professor, Dept of IT.

Ch.Vaishnavi (IV-I Student)

R.Bhanu (III-I Student)

K.Poojitha (III-I Student)

K.Sravya (II-I Student)

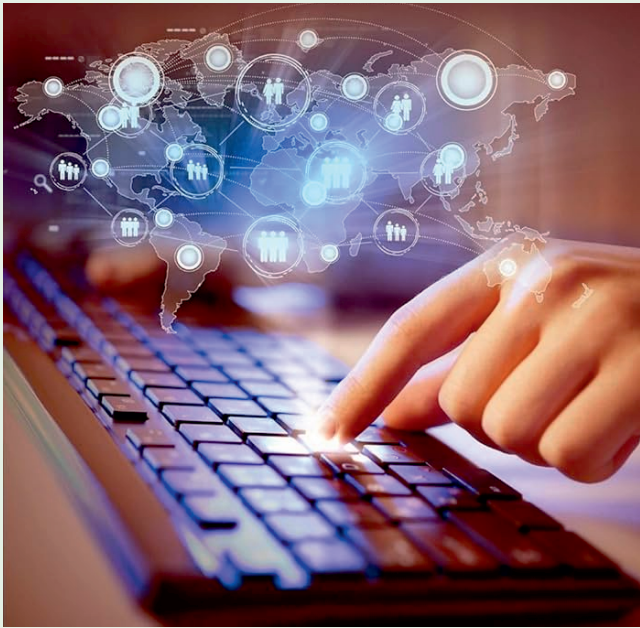
INFORMATION TECHNOLOGY

The Department of Information Technology was established in 2019 with an initial intake of 60 students. Since its inception, the department has been committed to providing excellent learning facilities and a dynamic academic environment that nurtures competent engineers capable of meeting both national and global industry standards.

The department's success is driven by the creativity, innovation, and dedication of its faculty and students. To strengthen technical competence, students are offered various in-house training programs designed to enhance their practical skills and domain expertise. The academic focus extends beyond theoretical knowledge, emphasizing holistic personality development through a blend of technical, analytical, and interpersonal skills.

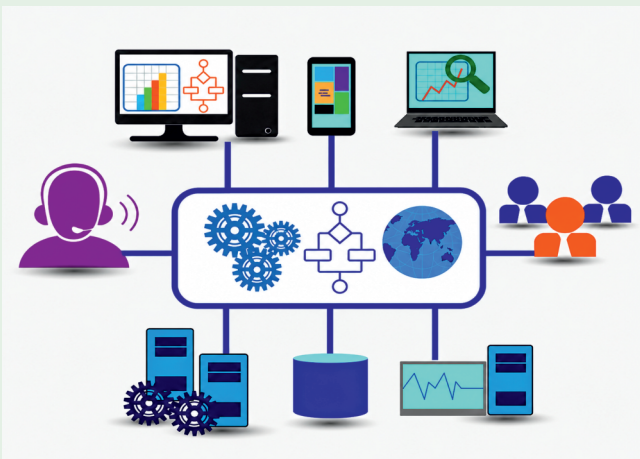
The department regularly organizes workshops, seminars, and conferences to keep students and faculty abreast of emerging technologies in the field of Information Technology. Many of our students have secured placements in leading IT companies, while others have pursued higher education at top-ranked universities in the USA and other countries.





The collective efforts of both faculty and students have significantly contributed to the department's achievements and recognition. The Information Technology Students' Association (ITSA) plays an active role in organizing diverse academic and co-curricular activities such as quizzes, extempore sessions, mock interviews, debates, alumni seminars, guest lectures, and technical fests. ITSA also conducts specialized training programs to bridge curriculum gaps and explore topics beyond the syllabus.

Furthermore, students are encouraged to participate in social outreach programs and extracurricular activities, fostering a spirit of leadership, teamwork, and community engagement.



HOD'S MESSAGE

Dr. D. Shanthi

Postdoc (USA), PHD(CSE),
M.Tech(CSE), B.Tech(CSE), PG.Diploma
in AI(NITW), (M.SC.(Psychology), AU)
Professor & Head of the Department,
Department of Information Technology
Mobile: +91 8125174595
Email: drshanthicse@gmail.com

Dr. D. Shanthi brings 18 years of experience to her role as Professor and Head of the Department of Information Technology at VMTW, Hyderabad, India. She completed her Postdoctoral research at California Public University (USA) and holds a PG Diploma in AI & ML with a 3.66 CGPA from NITW. Dr. Shanthi earned her Ph.D. in Computer Science from JNTU Hyderabad in 2020. She comes from a core Computer Science Engineering background. She also qualified the UGC NET examination in 2024. Additionally, she holds 3 copyrights, including 2 national and 1 international. Dr. Shanthi has been invited as an expert by esteemed organizations such as RCI (Hyderabad), IEI (Hyderabad), Telangana State Residential Degree Colleges, Thiruvalluvar University (Tamil Nadu), SRM (AP),

and Chaitanya Deemed University (Hyderabad). She has 2 scholars from CDU and Lincoln University College (Malaysia), under her guidance one scholar got his PHD. She has also been recognized as a research guide by JNTUH. She has authored 45 research papers in prominent international and national journals, including IEEE, Springer, and Inderscience, and few are presented at notable conferences. Her research citations are 537 H-Index: 12 and I10 Index: 13 and one of her research article won the “Best Paper Award” in 2019. Her accolades include the “Young Scientist Award” from DK International Research Foundation Faculty Awards in 2019, the “Outstanding Research Faculty Award” from Amaravathi Research Academy Faculty Excellence Awards in 2020, and the “APJ Abdul Kalam Award” from Shikshak Kalyan in 2021. Dr. Shanthi has published 2 national-level books, 4 international books, 3 Scopus-indexed book with Bentham Science, and 1 AICTE local language translation of a Software Engineering textbook. She is an active member of professional bodies such as FSIESRP, MIAENG, LMCSI, MEMRC, and MIEEE, and serves on the editorial boards of several journals, including the American Journal of Software Engineering and Applications, IJERT, and Microprocessors and Microsystems (SCI Journal), Discover Computing (springer Journal).



1.FACULTY ARTICLE ON “ENHANCING VIDEO EMOTION RECOGNITION THROUGH NOVEL CNN ARCHITECTURES AND TEMPORAL RELATION EXTRACTION”

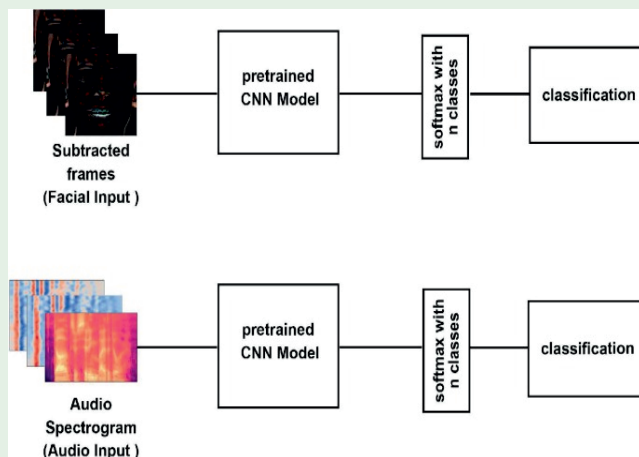
By Venkat Rao Ubbala
Assistant Professor, Dept of IT

Title: “Enhancing Video Emotion Recognition Through Novel Cnn Architectures And Temporal Relation Extraction”

The task of emotion recognition from video data has become increasingly important in realms such as human–computer interaction, healthcare services and entertainment. The introduction of Convolutional Neural Networks (CNNs) have shown its promise in this field, however additional techniques are necessary to improve the performance and accuracy of video emotion recognition systems. In laying out our three new algorithms we articulate some of the most immediate research needs in this space, including temporal relation extraction methods and availability of multimodal integration methodology as well as more advanced CNN architectures. In the first part of our algorithm, we build a Temporal Relation Attention Network (TRAN) to capture fine-grained temporal dependencies between frames in reason for better behavioral emotional cue recognition. Dynamic Temporal Convolutional Network (DTCN) attempts to address this problem by introducing dynamic operations into convolution and effectively retaining temporal features so that the model can be more sensitive for subtle changes in emotions related facial expressions. Moreover, MFT algorithm integrates the audio and visual modalities with transformer networks to better fuse information from different sources for more extension emotion recognition.

The Temporal Relation Graph Convolutional Network (TR-GCN) introduces graph convolution operations to dynamically represent temporal relations among video sequences, which is a more expressive way while elaborating complex spatio-temporal dynamics with receiver side. Experimental results indicate that our deliver high-quality, user-centric solutions that drive innovation and contribute to technological advancement.

algorithms improve the efficiency significantly and up to state-of-the-art performances are obtained in terms of emotion prediction accuracy for video data. Experiments using benchmark datasets verify the effectiveness of our new techniques in capturing temporal dynamics, integrating multimodal information and taking advantage of fine state-of-the-art CNN architectures to enhance emotion recognition performance. The work helps video emotion recognition systems to achieve better performance, paving the way for more precise detection in real-world usage.

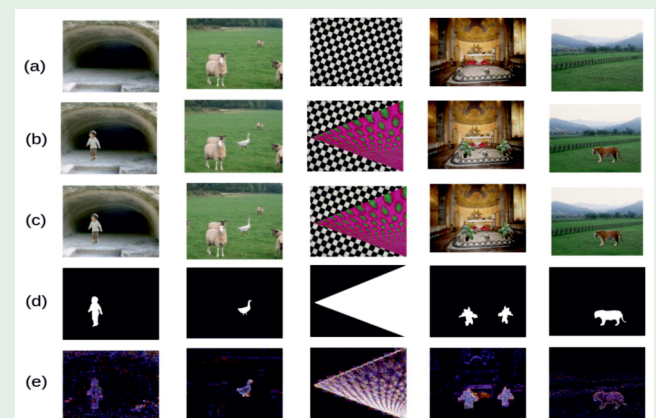


2.FACULTY ARTICLE'S ON FUSION-DRIVEN DEEP LEARNING FRAMEWORK FOR IMAGE FORGERY DETECTION

By Mrs. K. Sandhya Rani,
Assistant Professor, Dept of IT

Title: Fusion-driven Deep Learning Framework For Image Forgery Detection

As digital media is growing rapidly, image forgery is rising to a significant concern regarding trust and authenticity of online content. This research presents a deep learning-based framework using the fusion principle to detect manipulated images with high accuracy. The proposed model utilizes a variety of feature extraction methods, including Convolutional Neural Network (CNN) features, texture features, and frequency domain features to harness color, visual, and structural inconsistencies, respectively. The proposed framework establishes a feature-level fusion of spatial and frequency features to differentiate between authentic and tampered regions. Extensive experiments across benchmark datasets demonstrate that the system outperforms existing image forgery detection methods with accuracy and resilience to the more sophisticated forgery techniques, including copy-move, splicing, and retouching. The primary contribution of this research is to advance the considerable research and development of intelligent, automated systems that will contribute to the protection of digital integrity in journalism, forensics, and social media monitoring.



1. STUDENT'S ARTICLE ON DETECTING CYBER ATTACKS THROUGH MEASUREMENTS: LEARNINGS FROM A CYBER RANGE

By SATHVIKA 23UP1A1207 III-IT

Title: Detecting Cyber Attacks Through Measurements: Learnings from a Cyber Range

In the digital age, cybersecurity has become one of the most critical challenges for organizations and individuals alike. The article “Detecting Cyber Attacks Through Measurements: Learnings from a Cyber Range” explores how simulated environments, known as cyber ranges, can be effectively used to study, analyze, and prevent cyber threats. A cyber range is a controlled, virtual training platform where real-world cyber-attack scenarios are recreated, allowing researchers and students to observe attack behaviors, evaluate detection tools, and strengthen defense mechanisms. Through the use of measurable parameters such as network traffic patterns, CPU utilization, and anomaly detection metrics, participants gain a deep understanding of how cyberattacks manifest and evolve in real time. Machine learning models trained on this measurable data help identify deviations that may indicate intrusions or malicious intent. Students participating in these exercises develop practical skills in intrusion detection, malware analysis and security monitoring—skills that are essential for future cybersecurity professionals. Moreover, these simulations encourage teamwork, problem-solving, and the application of theoretical knowledge to real-world conditions. The key learning outcome from cyber range experiments is the ability to interpret system measurements as indicators of security posture, empowering organizations to adopt proactive defense mechanisms rather than reactive responses. Thus, the integration of measurement-based learning within cyber ranges serves as an innovative educational and research approach for understanding and combating modern cyber threats.

2.STUDENT'S ARTICLE ON A KNOWLEDGE-BASED RECOMMENDATION SYSTEM THAT INCLUDES SENTIMENT ANALYSIS AND DEEP LEARNING

By K NAIMISHA 23UP1A1218 (III-IT)

Title: A Knowledge-Based Recommendation System that Includes Sentiment Analysis and Deep Learning

The growing amount of online content, from e-commerce reviews to social media comments, has made recommendation systems essential to modern digital experiences. The article “A Knowledge-Based Recommendation System that Includes Sentiment Analysis and Deep Learning” looks at how combining knowledge-based models with artificial intelligence can lead to smarter, more human-like recommendations. Traditional recommendation systems focus on user history and item similarity, but they often overlook the emotional tone or context behind user choices. By adding sentiment analysis, the system can determine whether a user's feedback is positive, negative, or neutral, giving better insight into their real interests. Deep learning methods, like recurrent neural networks (RNN) and convolutional neural networks (CNN), help the model handle large - datasets, recognize complex patterns, and respond to changing user behaviors. A knowledge-based layer supports decision-making by bringing in domain-specific rules, semantic relationships, and factual data, making recommendations accurate, relevant, and understandable. For example, in an online shopping platform, the system could suggest products not just based on past purchases, but also by analyzing emotional tones in reviews and understanding the context of product categories. This combination of sentiment analysis and deep learning leads to a smarter,

more understanding user experience. These systems represent a big step toward personalized AI-driven technology, showing how emotion-aware computing can change how we engage with digital platforms.

FDP's Attended By It Faculty

Sl. No	Name of the Faculty	Title of the Workshop/ FDP/STTP	Organized College	Duration
1	Dr.D. Shanthi	Intelligence Reimagined: A Journey from AI to GenAI Application	VMTW	1 week
		AI IoT in Electrical Engineering Applications	Geetanjali	1week
2	Mrs. A. Eenaja	Educate The Educator on Generative AI	VMTW	2weeks
		Prompt Engineering and Chat GPT Utilization	VMTW	2weeks
3	Mrs. K. Helini	A journey from AI to Gen AI Applications	VMTW	2weeks
		Harnessing Machine Learning from Fundamentals to applications	VMTW	2weeks
4	Mrs. B. Archana	Educate the Educator on Generative AI	VMTW	2weeks
		Harnessing Machine Learning from Fundamentals to Applications	NIT Warangal	2weeks
5	Mr.Venkat Rao Ubbala	AI in cyber security securing the Digital Feature	LBCE	2weeks
		AI from Data Science Generative Ai it' an application	VMTW	2weeks
		Block Chain and Fintech (Central Od Development of Advance Computing)	VMTW	2weeks
		Role Of Artificial Intelligence (AI) & Machine Learning (ML) In Aerospace (Webinar)	The Institution of Engineers (India)	2weeks
		AI and Cloud based Tools for Research	NITTTR	1week
6	Mrs. D. Kousari Kumari	Harnessing machine learning from fundamentals to Applications	VMTW	1week
7	Mrs. A. Rajini Devi	ATAL) Academy Faculty Development Program on Strategic Approaches and Emerging Trends in Data Science at Federal Institute of Science and Technology (FISAT)	ATAL	1 week

Student's Participation

Industrial Visit NSIC:

Date: 9th October 2025

Venue: NSIC Technical Services Centre

The Department of Information Technology organized an industrial visit to the NSIC Technical Services Centre on 13th October 2025. The visit aimed to provide students with practical insights into entrepreneurship development and government support for start-ups. The team was warmly welcomed by Mr. Koushik, Manager at NSIC, who shared valuable information about the various

programs and initiatives supporting budding entrepreneurs in India.



During the session, Mr. Koushik discussed key topics such as the concepts and traits of entrepreneurship, highlighting the qualities required to become a successful entrepreneur. He elaborated on the Government's flagship initiatives like Start-up India, Stand-up India, and Make in India, explaining how they encourage innovation and self-employment among youth. The process of company registration and the legal formalities involved were also clearly explained.



The students learned about funding opportunities and financial assistance schemes such as Mudra Loans, PMEGP, and CGTMSE, along with various government subsidies, incentives, and concessions available for small and medium enterprises. Mr. Koushik also emphasized the importance of customer service, marketing strategies, and

Department of Information Technology Industrial Visit to NSIC, Kushaiguda



innovation in sustaining a business in today's competitive world.



In the afternoon session, participants were inspired by success stories of local entrepreneurs who achieved remarkable growth with the help of NSIC's guidance and government schemes. The visit was highly informative and motivated students to explore entrepreneurship as a viable career path.

SAC Activities



The Department of Information Technology of Vignan's Institute of Management and Technology for Women, in association with the National Service Scheme (NSS) unit, organized a "Medical Camp" on 11th October 2025 at the VMTW Campus near IQAC. The event was conducted in collaboration with Zero7 Technologies (Training and Development). The camp aimed to promote health awareness among students and staff and to encourage regular health checkups. Various medical services were offered during the camp, including ECG (Electrocardiogram), diabetes (blood sugar) checkup, blood pressure monitoring, weight and BMI measurement, eye

examination, and dental checkup. Professional doctors and healthcare experts provided medical consultations and valuable health advice to participants. The initiative received an overwhelming response, reflecting the institution's commitment to the well-being of its community and fostering a culture of health consciousness among young minds.



Kalam's Institute of Youth Excellence organized a grand celebration to mark the 94th Birth Anniversary

Kalam's Institute of Youth Excellence organized a grand celebration to mark the 94th Birth Anniversary of Bharat Ratna Dr. A.P.J. Abdul Kalam, one of India's most beloved visionaries and the "Missile Man of India." The event was a heartfelt tribute to the great scientist, teacher, and former President of India, whose life continues to inspire millions across the nation. The program was graced by the presence of distinguished personalities, including Dr. G. Satheesh Reddy, eminent scientist and former Chairman of the Defence Research and Development Organisation (DRDO), as the Guest of Honour, and Mr. Shubhanshu Shukla, as the Chief Guest. Both dignitaries emphasized Dr. Kalam's vision for a technologically advanced and self-reliant India, encouraging young students to pursue

excellence in science and innovation with dedication and integrity. The event began with the traditional lighting of the lamp, followed by a floral tribute to Dr. Kalam's portrait. Students delivered inspiring speeches, recited poems, and presented cultural programs showcasing the values of perseverance, humility, and patriotism that Dr. Kalam stood for. A special documentary highlighting his life journey and achievements was screened, which left the audience deeply moved.



In his address, Dr. Satheesh Reddy shared personal experiences working alongside Dr. Kalam, reminding students of his unwavering faith in the power of youth and education. Chief Guest Mr. Shubhanshu Shukla motivated the audience to dream big and contribute to nation-building through innovation and service.



The Celebration Concluded With The Pledge To Carry Forward Dr. Kalam's Ideals Of Knowledge, Simplicity, And Service To Humanity. The Event Not Only Honored A Great Leader But Also Reignited The Spark Of Curiosity And Purpose Among The Youth — The True Legacy Of Dr. A.p.j. Abdul Kalam. Celebrating Rakhi With Patriotism And Technology This Year, The Information Technology Department At Vignan's Institute Of Management And Technology For Women Celebrated Raksha Bandhan In A Truly Meaningful Way. Our Students Not Only Honoured The Sacred Bond Of Rakhi Within The

NSS Activities

campus but also extended their love and respect to the brave soldiers of the Indian Army by tying rakhis for them. Raksha Bandhan, a festival symbolizing protection and care between siblings, was transformed into a heartfelt gesture of gratitude and patriotism. IT students showcased their creativity by crafting unique, tech-inspired rakhis that reflected the spirit of innovation and tradition combined. In addition to making and tying rakhis, students recorded warm virtual messages for the army personnel, expressing appreciation for their sacrifices and dedication to the nation. This initiative strengthened the connection between the department's technical skills and its social responsibility, fostering a culture of empathy and national pride.

Throughout the celebrations, our department contributed in unique ways—organizing daily aartis, a tech-and-tradition quiz, and even assisting in event management through digital tools and platforms. It was wonderful to see how tradition can be enhanced through technology, and our students made that vision a reality. The event was a proud moment for the Information Technology Department,

reinforcing the importance of cultural values and the power of community engagement. We thank all students and faculty who participated and contributed to making this Rakhi celebration special.



Activities

Bathukamma Celebrations By The Department Of Information Technology Celebrating Culture, Creativity & Community The Department Of Information Technology At Vignan's Institute Of Management And Technology For Women Joyfully Celebrated The Vibrant Festival Of Bathukamma, Turning The Department Into A Colorful And Festive Space Filled With Tradition, Music, And Unity.



Bathukamma, a floral festival unique to Telangana, honours Goddess Gauri and celebrates the spirit of womanhood. The women of the IT department actively participated by preparing stunning Bathukamma made from seasonal flowers such

Bathukamma Made From Seasonal Flowers Such As Tangedi, Gunuka, Banthi, And Chamanti. These Beautifully Arranged Flower Stacks Were Displayed With Pride And Devotion. The Event Began With A Brief Talk On The Cultural Significance Of Bathukamma, Followed By Energetic Performances Of Traditional Songs And Dances. The Entire Department Came Together To Support The Celebration — From Faculty Members Encouraging Participation, To Students Helping With Organizing And Decor. Cultural Events & Tech Integration A Special Bathukamma Competition Was Held As Part Of The Festivities, Where Participants Showcased Their Creativity And Dedication. The Judging Was Based On Criteria Such As Creativity, Traditional Authenticity, Flower Arrangement, And Overall Presentation. Three Winners Were Selected And Awarded Prizes For Their Outstanding Bathukammas: First Prize: Rongali Bhanu Second Prize: Bhavya Sree & Third Prize: Akhila



The celebration ended with the traditional Bathukamma dance, where students formed circles around the flower arrangements and sang folk songs, clapping in rhythm, creating an atmosphere of joy and cultural pride. The event was a true reflection of how technology and tradition can coexist, with students from a modern academic stream.

GANESH CHATURTHI AND VISARJAN

This year's celebrations began with the welcoming of Lord Ganesha, where our department took the lead in organizing a week filled with devotion and dynamic cultural events. The mandap decorations stood out with tech-themed elements—LEDs, digital posters, and QR codes linking to eco-friendly practices, all crafted by our talented IT students.



Mud Clay Ganesha Making Competition

One of the highlights of the celebration was the Mud Clay Ganesha Making Competition, aimed at promoting eco-consciousness and traditional art. Students showcased their creativity and respect for sustainability by crafting beautiful Ganesha idols using natural clay. After much deliberation by our faculty panel, the winners were announced as:

1st Place – D. GEETHIKA, 2nd Place – K SHRUTHI, 3rd Place – M SHRAVANI

Congratulations to our winners and all participants for making this event truly artistic. On the day of immersion, the IT Department led a vibrant and heartfelt Ganesh Nimajjanam procession. With music, dance, and devotion, -

our students celebrated the farewell of Bappa in the most memorable way—while also ensuring the idol immersion followed eco-friendly protocols embracing age-old customs and celebrating them with great enthusiasm. Celebrating the Spirit of Unity – Ganesh Nimajjanam 2025

Professional Societies/Bodies

S.N.	Name of the Faculty	Name of the Professional Society /Body at National and International Level	Name of the Grade/ Level/Position
1	Dr.D. Shanthi	CSI	Life Member
2	Dr.D. Shanthi	IEEE	Member
3	Dr.D. Shanthi	IAENG	Life Member
4	Dr.D. Shanthi	FSIESRP	Life Member
5	Dr.D. Shanthi	AIMERS	Member
6	Dr.D. Shanthi	IFERP	Member
7	Dr.D. Shanthi	MEMRC	Life Member
8	Dr.P.Eswaraiah	IAENG	Life Member
9	Dr.P.Eswaraiah	IFERP	Life Member
10	Mr.Janakiraman Ranjith	IAENG	Life Member
11	Mrs.Swapna Chiluguri	ISTE	Life Member
12	Mrs.Swapna Chiluguri	IFERP	Member
13	Mrs.Swapna Chiluguri	IAENG	Life Member
14	Mrs.Kolan Helini	AIMERS	Member
15	Mrs.Kolan Helini	IFERP	Member
16	Mrs. P.Amreswari	IAENG	Life Member
17	Mrs. P.Amreswari	IFERP	Member
18	Mrs.Eenaja Aileni	IAENG	Life Member
19	Mrs.Eenaja Aileni	AIMERS	Member
20	Mrs.Bojjapalli Archana	AIMERS	Member
21	Mrs.Bojjapalli Archana	IAENG	Life Member
22	Mrs.Bojjapalli Archana	SDIWC	Member
23	Mr.U.Venkat Rao	NDLI Club	Member
24	Mr.U.Venkat Rao	AIMERS	Member
25	Mr.U.Venkat Rao	IAAC	Member
26	Mr.U.Venkat Rao	CSI	Member
27	Mr.U.Venkat Rao	ABCDINDEX	Life Member
28	Mr.U.Venkat Rao	IFERP	Member
29	Mrs.FouziyaMojammed	IAENG	Life Member
30	Mrs.FouziyaMojammed	IFERP	Member
31	Mr.ChandraShekher Sangishetty	IAENG	Life Member
32	Mr.ChandraShekher Sangishetty	IFERP	Member
33	Mr.Srinivasarao Munagala	IFERP	Member
34	Mrs.Sandhya Rani Gangu	IAENG	Life Member
35	Mrs.Sandhya Rani Gangu	FSIESRP	Member
36	Mrs.Sandhya Rani Gangu	AIMERS	Member
37	Dr.A.Sudheer Babu	IFERP	Member
38	Dr.Ch. Baswaraj	IFERP	Member

Program Outcomes (Adapted from NBA)

Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

