ASHOKRAO MANE POLYTECHNIC, VATHAR TARF VADGAON

MECHANICAL ENGINEERING DEPARTMENT

THEME- COMPOSITE MATERIALS

MECH-MASTER NEWS LETTER

Vol-XI: Issue-I, November-2025

ABOUT INSTITUTE

Shri. Balasaheb Mane Shikshan Prasarak Mandal Ambap's, Ashokrao Mane Polytechnic, Vathar (AMPV) was established in 2008 and is located near Kolhapur. The institute has AICTE approval for the Seven diploma courses. Under the visionary leadership and administration, AMPV has emerged as a leading technological institute and is perfect destination for quality technical education. The institute has NBA accredited Programmes, 100% placements in MNCs, best academic results, well established labs. The institute has also been honoured with notable awards.

VISION OF THE DEPARTMENT

To excel in engineering education for creating competent mechanical engineers with high social and ethical standards to serve the society.

ABOUT DEPARTMENT

Mechanical Engineering Department was established in 2008 in beautiful campus of AMP, Vathar. The department is honoured with NBA accreditation, ISO certification and also received excellent / very good remark by MSBTE.

The department has well equipped laboratories and excellent upgraded facilities. The department has an enthusiastic team of qualified and experienced teaching and non-teaching staff.

The department attracts aspiring students every year and aims to provide solid foundation for careers in industry, research and academia. The department has great history of highest admissions, best academic results and Higher placements.

The department also conducts various departmental activities like technical events, expert lectures, industrial visits, career guidance training programs and workshops to enhance students' technical knowledge.

MISSION OF THE DEPARTMENT

m1. To impart basic as well as discipline knowledge to solve engineering problems.
m2. To direct towards skill development by using modern tools and emerging technologies to enhance employability.
m3. To develop leadership qualities and ability to visualize needs for entrepreneurship development.
m4. To inculcate sense of responsibility towards society and environment through professional and social ethics.

INSIDE

CHIEF EDITOR:
Mr. S. N. Yadav
EDITORIAL COMMITTEE:
1. Mr. P. S. Patil
2. Mr. S. B. Lambe
3. Mr. R. D. Nagvekar
4. Mr. Rohan V. Mohite
5. Miss. Poonam R. Pawar
6. Miss. Najiya A. Sutar

Dr. Yuvraj R. Gurav
Principal,
Ashokrao Mane Polytechnic, Vathar Tarf Vadgaon.

Dear Readers,
Best wishes to all. It's a proud moment to interact with the readers. Newsletter is an initiative by department which has a specific purpose in it. The contribution made so far by the teachers, students, academicians and industrialists has compelled to promote such moves in the era of emerging technologies such as Robotics, Artificial Intelligence, Machine Learning, Internet of Things, etc. Newsletter is also acting as a medium to convey message about its vision and values along with future strategies and plans. The newsletter has a unique theme "COMPOSITE MATERIALS", which is widely used now a days, I appreciate the editing team, which is putting efforts of compiling various news about diploma education system in department along with views and information about a relevant theme and disseminating it to a cohesive community of stakeholders - students, faculty, parents, administrators, institutes, industry and community at large, through this newsletter.

Mr. Sunil N. Yadav
H.O.D. Mechanical Engineering,
Ashokrao Mane Polytechnic, Vathar Tarf Vadgaon.

Greetings to faculties and friends !
It gives immense pleasure to congratulate department newsletter committee for releasing semester wise department newsletter. We strived hard, gave our best possible efforts to make the newsletter "MECH-MASTER" really versatile.
We have tried to give the students those memories that stand as a footprint of progress where each word speaks out with knowledge. It gives the scope and freedom to imagination power of the students to express their line of thought through creative ideas. Besides, imagination is a mirror to our academic progress, co-curricular and extra-curricular activities, achievements and a reflection of the strength of our department that gives us new energy to grow. The Mechanical Engineering department is striving towards the goal of providing innovative and quality education with high standard to achieve academic excellence.

DEPARTMENTAL NEWS

FACULTY DEVELOPMENT PROGRAM

The National Level Online Faculty Development Program (FDP) was organized over three days, from 20th to 22nd August 2025. The Day-1 program commenced with a welcome by the FDP Coordinator, Mr. R. D. Nagvekar, followed by the welcome address and an overview of FDP dynamics delivered by Mr. S. N. Yadav, Head of the Department of Mechanical Engineering.In his inaugural speech Principal Prof. Y. R. Gurav, shared his views on the importance of faculty development programs and the institute's vision towards continuous professional growth. Subsequently, as per the scheduled program, each resource person conducted their respective sessions effectively, providing clear explanations and engaging interactions with the participants.The program concluded with a vote of thanks proposed by Mr. R. D. Nagvekar.

INDUCTION PROGRAM



On 1st July 2025, the first day of the academic session for the Second Year, the Department of Mechanical Engineering organized the Second Year Induction and Welcome Function. During the program, first-year toppers were felicitated by the dignitaries on the dais through the presentation of prize gifts. Subsequently, all second-year students were warmly welcomed with pen gifts from the teaching and non-teaching staff. Following this, the Mechanical Engineering Students' Association (MESA) in-charge, Mr. V. A. Patil, shared information about MESA and presented the planned activities for the academic year 2025–26. Thereafter, HOD Mr. S. N. Yadav, introduced the Mechanical Engineering Department and provided important information regarding the second-year academic curriculum and departmental activities.

CELEBRATION OF GURUPORNIMA



The Department of Mechanical Engineering organized a Guru Purnima Program on 10th July 2025, during which students expressed their thoughts and heartfelt appreciation for their teachers. The event was formally inaugurated by Principal Dr. Y. R. Gurav in the presence of Mr. S. N. Yadav, Head of the Mechanical Engineering Department, along with the faculty members, staff, and students of the department. Guru Purnima is a culturally and spiritually significant occasion dedicated to honoring teachers, mentors, and guides who play a vital role in intellectual and personal development. Gurupornima, celebrated on the full moon day of the Hindu month of AAshadh, the day commemorates the birth anniversary of Maharshi Ved Vyasa, who is revered as a symbol of profound wisdom and scholarly excellence.

CELEBRATION OF TEACHER'S DAY


Teacher's Day is celebrated to commemorate the birth anniversary of Dr. Sarvepalli Radhakrishnan, one of the most distinguished scholars and exemplary teachers of his time. On this occasion, the Department of Mechanical Engineering, in association with MESA, successfully organized an Expert Lecture on "Importance of Teachers in Our Life" for the Third Year Mechanical Engineering students on 04/09/2025. Teachers play a vital role in shaping students' lives and guiding them toward success. They not only impart academic knowledge but also instill values, discipline, and self-confidence. Teachers inspire students to think creatively, work diligently, and grow into responsible citizens. As mentors, they identify students' strengths and help them overcome their weaknesses. The program was celebrated by the students and staff members of the Mechanical Engineering Department, through the conduction of lectures by students, where a few students from the second and third year assumed the role of teachers.

CELEBRATION OF ENGINEER'S DAY

Mechanically Operated Eagle (Garud)

On the occasion of Engineer's Day, the Department of Mechanical Engineering, in association with MESA, successfully launched the "Mechanically Operated Eagle (Garud)" project in the Mechanical Engineering Department corridor at Ashokrao Mane Polytechnic, Vathar, on Friday, 15th September 2025. The project was developed by the students of the Mechanical Engineering Department under the guidance of Mr. S. N. Yadav, Head of the Mechanical Engineering Department, Mr. R. D. Nagvekar, Project Coordinator, along with the workshop staff.

The Project was inaugurated by Hon. Vijaysinh Mane Saheb, President, AMG, in the presence of Principal Dr. Y. R. Gurav, Head of the Mechanical Engineering Department Mr. S. N. Yadav, other distinguished dignitaries and students.

The Garud mechanism is a decorative automaton based on the inversion of a slider-crank mechanism, wherein continuous rotary motion is converted into oscillatory motion. This motion is then transferred to a stylized figure of Garud (a bird) and its wings, demonstrating the effective application of mechanical linkages in an engaging and educational manner.

Assembly Champ Event

The Department of Mechanical Engineering proudly organized the technical event Assembly Champ on the occasion of Engineer's Day, on Tuesday, 15th September 2025. The competition was conducted by the students of the Mechanical Engineering Department under the guidance of Mr. P. S. Patil and Mr. P. H. Shinde, Competition Coordinators.The event was inaugurated by Principal Dr. Y. R. Gurav in the presence of Head of the department, Mr. S. N. Yadav, Departmental MESA Coordinator Mr. R. D. Nagvekar, Program Coordinators Mr. P. S. Patil and Mr. P. H. Shinde along with members of the organizing committee Mr. S. B. Lambe, Mr. S. R. Koli, Mr. R. P. Bagewadi and the participants. A total of 236 students from various departments participated in the event. Each participant was given two minutes to assemble the provided components, testing their technical skills, accuracy, and time management. The students securing the top three positions were awarded certificates and attractive prizes, while all other participants received participation certificates. Principal, Dr. Y. R. Gurav gave away the prizes to the winners in the presence of the faculty members of the Mechanical Engineering Department and the participants, marking the successful conclusion of the event.

Inauguration of Newspaper Reading Center

On the occasion of the Establishment Anniversary of Ashokrao Mane Polytechnic, Vathar, the Department of Mechanical Engineering, in association with MESA, started a "Newspaper Reading Center" in the Mechanical Engineering Department corridor on Monday, 04th August 2025. The initiative was conceptualized by Mr. S. N. Yadav, Head of the Mechanical Engineering Department, and Mr. R. D. Nagvekar, MESA Coordinator, with the objective of fostering awareness of current affairs and employment opportunities among students.

It was inaugurated by Principal Dr. Y. R. Gurav, in the presence of HOD Mr. S. N. Yadav along with other distinguished dignitaries.

LOH KOT FORT REPLICA



On 15/11/2025 Honourable Director Mrs. Manisha Vijaysinh Mane (Vahinisaheb) inaugurated the exhibition of the fort model, skilfully constructed by the Mechanical Engineering Department using metal scrap and old workshop jobs as part of the Maharashtra Govt. Amrit Durgostav program. Principal Dr. Y. R. Gurav, HOD Mr. S. N. Yadav, Faculty members and students were present on this memorable occasion.The model was conceptualized and constructed by the staff members and students of the department using job workpieces fabricated in the workshop along with scrap and waste metal materials, primarily iron. The project reflects the ingenuity, teamwork, and dedication of the department towards sustainable practices and innovation.The name Lohkot—derived from the Hindi word “Loha” meaning iron—symbolizes strength, unity, and resilience. Every component of the fort, from its sturdy walls to intricate towers, was carefully designed and assembled to represent the grandeur of traditional Indian forts while emphasizing the importance of recycling and reusing materials.The initiative not only added to the festive spirit of Durg Mohotsav but also served as an excellent demonstration of engineering craftsmanship . The department’s effort was widely appreciated by visitors, faculty, and students.

THIRD YEAR PARENT MEETING


The Mechanical Engineering Department organized a Parents' Meet on 19/11/2025 with the objective of strengthening the relationship between the institute and parents, and to discuss the overall academic progress and development of the students. The event was attended by parents, faculty members, class coordinator and mentors. The program began with a welcome address by Mr. P. S. Patil. HOD Mr. S. N. Yadav emphasized the importance of parents' involvement in students' academic and personal development. Following this, Principal. Dr. Y. R. Gurav. shared valuable insights about the institute's initiatives, academic performance, placement opportunities, and upcoming activities. Faculty members presented detailed reports on students' attendance, internal assessment performance, classroom behaviour, and participation in activities.

SECOND YEAR PARENT MEETING


The Department of Mechanical Engineering organized a Parents’ Meet on 19/09/2025 with the objective to discuss the overall academic progress and development of the students. The event was attended by parents, faculty members, class coordinator and mentors. The program began with a welcome address by Mr. R. P. Bagewadi. HOD Mr. S. N. Yadav emphasized the importance of parents’ involvement in students’ academic and personal development. Following this, the Principal, Dr. Y. R. Gurav, shared valuable insights about the institute’s initiatives, academic performance, placement opportunities, and upcoming activities. Mentors gave detailed reports on students’ attendance, internal assessment performance, classroom behavior. Parents were encouraged to interact freely and share their suggestions.

EXPERT LECTURES




Expert Lecture on "Guru- The true architect for student personality".

The Department of Mechanical Engineering organized an Expert Lecture on "Guru – The True Architect of Student Personality" for Second Year Mechanical Engineering students on 10/07/2025, from 04:15 pm to 05:30 pm. The lecture was delivered by Mr. Avinash Arjun Khengat, Teacher, Jaywant Madhyamik Vidyalaya, Majale. The expert shared valuable insights on the role of a Guru in shaping a student's personality. A Guru serves as the true architect of a student's development by guiding them not only in academics but also in life. Through wisdom, discipline, and inspiration, a Guru helps shape students' character, values, and behavior. The lecture emphasized how a Guru supports students in discovering their potential, building confidence, and developing strong moral values.


Expert Lecture on "Roles and responsibilities of RTO".

The Department of Mechanical Engineering organized an Expert Lecture on "Roles and Responsibilities of RTO" for Third Year Mechanical Engineering students on 19/07/2025, from 04:15 pm to 05:30 pm. The lecture was delivered by Mr. Nitin Patil, RTO Inspector, Regional Transport Office, Kolhapur.

The expert provided insights into the functions of the RTO, including vehicle registration, issuance of driving licenses, conducting driving tests, vehicle inspections, and collection of road taxes and penalties. The session enhanced students' understanding of transport regulations and road safety measures.

The Department of Mechanical Engineering organized an Expert Lecture on "Production Tools and Production Drawing" for Second Year Mechanical Engineering students on 22/07/2025, from 04:15 pm to 05:30 pm. The lecture was delivered by Ms. Sayali Mohite, Production Executive, Tata Motors, Pune.

The expert provided valuable insights into Production tools - the equipments, machines, and instruments used to manufacture products accurately and efficiently and detailed technical production drawings that provide complete information about a component, including dimensions, materials, tolerances, and assembly instructions.




Expert Lecture on "Production tools and Production




Expert Lecture on "Importance of teachers in our life".

The Department of Mechanical Engineering organized an Expert Lecture on "Importance of Teachers in Our Life" for Third Year Mechanical Engineering students on 04/09/2025, from 05:15 pm to 06:30 pm. The lecture was delivered by Mr. Shivraj Prataprao Ghatage, Govt. Craft Instructor, Government Industrial Training Institute, Katol, Dist. Nagpur.

During the session, the expert highlighted the vital role of teachers in shaping students' lives and guiding them toward success. Teachers not only impart knowledge but also help develop values, discipline, and confidence. They inspire creativity, hard work, and responsible citizenship, while mentoring students to identify their strengths and improve upon their weaknesses.

INDUSTRIAL VISITS

Industrial Visit at "CASTCO & Alloy Steels (Mayura Group of Industries) Shiroli MIDC, Kolhapur 416122".

The Department of Mechanical Engineering successfully organized an Industrial Visit for Second Year Mechanical Engineering students on Wednesday, 30/07/2025. The visit was conducted at CASTCO & Alloy Steels (Mayura Group of Industries), Shiroli MIDC, Kolhapur – 416122, with the objective of providing students exposure to actual industrial work practices and enabling interaction with industry professionals.
A total of 50 students participated in the visit. The industrial visit was arranged for the following subjects:

1. Production Drawing
2. Basic Electrical and Electronics
3. Computer-Aided Drafting

During this visit students observed different foundry processes, foundry drawings, induction furnaces, conveyor system, thermocouples etc.

The Department of Mechanical Engineering successfully organized an Industrial Visit for Third Year Mechanical Engineering students on Wednesday, 24/09/2025. The visit was conducted at Mayura Steels Pvt. Ltd., Shiroli MIDC, Kolhapur, with the objective of providing students exposure to actual industrial work practices and facilitating interaction with industry professionals.
A total of 42 students participated in the visit. The industrial visit was arranged for the following subjects:

1. Automobile Engineering
2. Product Design and Development
3. Power Engineering

During this visit students observed casting processes for different automobile components, product development processes etc.

Industrial Visit at "Mayura Steels Pvt. Ltd . Shiroli MIDC, Kolhapur 416122".

Industrial Visit at "MG Motor Unique Auto Showroom, Shiroli MIDC, Kolhapur 416122".

The Department of Mechanical Engineering successfully organized an Industrial Visit for Final Year Mechanical Engineering students on Wednesday, 24/09/2025. The visit was conducted at MG Motor Unique Auto Showroom, Shiroli MIDC, Kolhapur, with the aim of providing students exposure to actual industrial work practices and facilitating interaction with industry professionals.
A total of 42 students participated in the visit. The industrial visit was arranged for the following subjects:

1. Automobile Engineering
2. Product Design and Development
3. Power Engineering

During this visit students observed different vehicles especially cars, thier assembly, transmission system, brake system, engine design, ignition system, wheel alignment procedure and wheel balnacing machine etc.

Faculty Speak

Mr. Pradip H. Shinde
Lecturer, Mechanical Engineering
Ashokrao Mane Polytechnic,
Vathar Tarf Vadgaon.

Compressive Review of Composite Materials

Ever increasing demands of high performance together with long life and light weight necessitate consistent development of almost every part of automobile. Increasing competition and innovations in automobile sector tends to modify the existing products or replacing old products by new and advanced material products. A suspension system of vehicle is also an area where these innovations are carried out regularly.

Composite materials consist of two or more physically dissimilar and instinctively separable components called reinforcement and matrix. These two components can be mixed in a restricted way to achieve optimum properties, which are superior to the properties of each individual component.

To meet the escalating demand for high performance in the automotive industry, ensuring longevity and continuous advancement of every automobile component is crucial, with lightweight construction taking precedence. These demands drive innovations in the sector, pushing for the replacement of existing materials with newer, more advanced ones. Consequently, such innovations are frequently incorporated into vehicle suspension systems. Leaf springs, traditionally integral to suspension systems in a variety of automobiles, including light motor vehicles, heavy-duty trucks, and rail systems, serve to absorb shock loads.

- **Materials Selection**

Materials make up a significant portion, approximately 60% to 70%, of the total cost of a vehicle. Additionally, they wield significant influence over the vehicle's quality and performance. Even a modest reduction in vehicle weight can yield significant economic benefits. This reduction in weight also enhances the vehicle's fuel economy. This weight reduction also contributes to the fuel economy of the vehicle. Composite materials have proven to be viable alternatives to steel for reducing the weight of vehicles. Hence, composite materials were selected for crafting the leaf spring design. Below are the detailed specifications of the fibers and resin materials employed in crafting the composite leaf spring design.

1. Fibres Selection

The fibres commonly used are.

i) Carbon fibre
ii) Boron fibre
iii) Glass fibre.

i) Carbon Fibre

The preferred reinforcement material for "advanced composites" is carbon fiber, chosen for its superior resistance surpassing that of glass or boron fibers, rendering it less prone to stress rupture. Carbon-reinforced composites find frequent use in low-strength applications requiring superior electrical properties, attributed to the high conductivity of carbon fiber.

iii) Boron Fibre

Boron fiber actually predates carbon fiber as a high-modulus material. However, the expense of boron has caused its decline, leading to its substitution with carbon fiber. Their tensile strength does not vary significantly from that of glass fibre, but they can possess a modulus five times greater than that of glass. Their tensile strength does not vary significantly from that of glass fibre, but they can possess a modulus five times greater than that of glass.

iv) Glass Fibre

Out of these options, glass fiber has been selected primarily for its cost-effectiveness and strength. Available types of glass fibers encompass C-glass, S-glass, and E-glass. C-glass fiber is designed for Enhancements have been made to the surface finish. whereas S-glass fiber is tailored for exceptionally high modulus, rendering it particularly suitable for aeronautical applications. E-glass fiber, esteemed for its high quality, serves as For all existing systems, the standard reinforcement fiber is utilized, fully satisfying mechanical property demands. Hence, E-glass fiber was deemed suitable for this particular application.

Fig 4.1 E-Glass

- Selection of Resins

The interlaminar shear strength in an FRP leaf spring is governed by the matrix system utilized. As these fibers serve as reinforcements regarding thickness, in the specified direction, Interlaminar shear strength remains unaffected by them. Thus, the matrix system should exhibit compatibility with the selected reinforcement fiber, particularly in terms of interlaminar shear strength characteristics. Numerous thermoset resins, including Fiber-reinforced plastics (FRP) fabrication involves the use of polyester, vinyl ester, and epoxy resin. Among these resin systems, epoxies demonstrate superior interlaminar outstanding mechanical properties, including shear strength. Therefore, epoxy resin is identified as the most suitable option for this application. Various grades of epoxy resins and hardener combinations are classified according to their mechanical properties. Out of these grades, Araldyte LY556 epoxy resin and HY951 hardener are chosen for this application. Araldyte LY556 is an epoxy resin devoid of solvents. When combined with hardener HY951, it cures into a tough resin. Hardener HY951 is a polyamine with low viscosity.

Mr. Somnath S. Koli
Lecturer, Mechanical Engineering
Ashokrao Mane Polytechnic,
Vathar Tarf Vadgaon.

Importance of Composite Materials in Engineering

- Composite materials represent a rapidly evolving domain in engineering due to their exceptional mechanical performance, reduced weight, corrosion resistance, and ability to meet modern design challenges. Their application across aerospace, automotive, energy, construction, and biomedical industries reflects their transformative role in advanced engineering.
- Classification of Composite Materials: In mechanical and manufacturing industries, composites such as fibre-reinforced polymers (FRP), metal-matrix composites (MMC), and ceramic-matrix composites (CMC) enable higher performance with reduced material consumption. Carbon fibre and glass fibre composites are now widely used for structural components due to their superior strength-to-weight ratio, fatigue resistance, and dimensional stability. In the automotive sector, composites contribute significantly to vehicle lightweighting, fuel efficiency, and emission reduction. Similarly, the aerospace industry relies heavily on advanced composites for achieving high structural efficiency, thermal stability, and safety

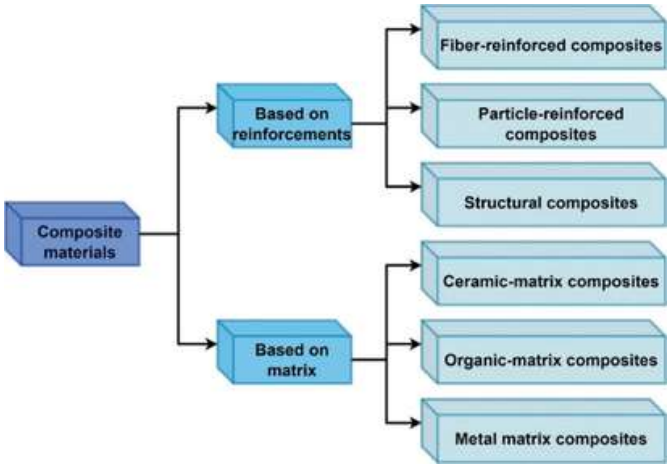


Fig. No.: 1 Classification of Composite Materials

Table No.: 01 Key Features of Composite Materials

Type	Example	Key Features
Fibre-Reinforced Polymers (FRP)	Carbon/Glass Fibre Composites	High strength-to-weight ratio, fatigue resistance
Metal-Matrix Composites (MMC)	Aluminium MMC	High thermal resistance, good wear properties
Ceramic-Matrix Composites (CMC)	SiC Composites	High temperature capability, oxidation resistance
Natural Fibre Composites	Jute/Hemp Composites	Eco-friendly, biodegradable, cost-effective

2. Recent Advancements: Recent research focuses on recyclable polymer matrices, natural fibre reinforcements, hybrid composites, and additive manufacturing–enabled composite fabrication. Automated fibre placement (AFP), topology optimization, resin transfer molding (RTM), vacuum-assisted infusion, and thermoplastic composites are leading industry trends.

3. Industrial Applications

• Aerospace: High structural efficiency, fatigue resistance, thermal stability
• Automotive: Lightweighting, fuel efficiency, emission reduction
• Renewable Energy: Wind turbine blades with high stiffness and durability
• Biomedical: Prosthetic limbs, implants, orthopedic devices
• Infrastructure: Reinforcement bars, composite bridges, corrosion-proof structures

4. Academic Importance

Teaching composite materials equips students with understanding of lay-up design, reinforcement selection, failure modes (delamination, fibre breakage, matrix cracking), and modern manufacturing technologies. Industrial case studies and simulation-based learning prepare students with industry-ready competencies.

5. Composite Material Structure Diagram: A composite material is made by combining two main constituents

1. Matrix (Continuous Phase)

Holds the reinforcement in place
Transfers load to the fibres/particles
Protects reinforcement from environmental damage

2. Reinforcement (Discontinuous Phase)

Provides strength, stiffness, and mechanical properties
Can be fibres (carbon, glass), particles, or whiskers

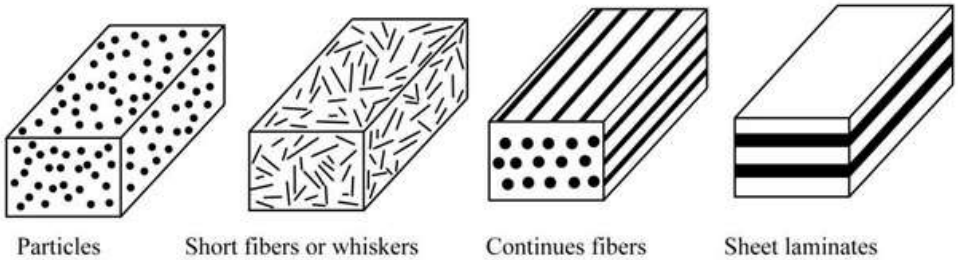


Fig. No. 2 Composite Material Structure Diagram

Composite materials represent one of the most significant advancements in the field of materials science and engineering, offering innovative solutions to many limitations of conventional materials. By combining two or more distinct constituents—typically a reinforcement and a matrix—composites achieve enhanced mechanical, thermal, and chemical properties that cannot be attained by individual materials alone. Their high strength-to-weight ratio, excellent stiffness, corrosion resistance, fatigue performance, and design flexibility have made them indispensable in modern engineering applications.

In today's industrial scenario, composite materials play a crucial role across a wide range of sectors, including aerospace, automotive, marine, civil infrastructure, renewable energy, defense, and biomedical engineering. The growing demand for lightweight structures, fuel efficiency, structural integrity, and sustainability has accelerated the adoption of advanced composites such as fiber-reinforced polymers, metal-matrix composites, and ceramic-matrix composites. Furthermore, advancements in manufacturing techniques like additive manufacturing, automated fiber placement, and resin transfer molding have improved production efficiency, cost-effectiveness, and quality control.

From an academic and educational perspective, understanding composite material behavior, fabrication methods, failure mechanisms, and applications is essential for preparing industry-ready engineering graduates. Faculty members play a vital role in bridging the gap between theoretical knowledge and practical implementation by incorporating case studies, laboratory experiments, simulation tools, and interdisciplinary learning approaches. As research continues toward eco-friendly and smart composite materials, continuous learning and innovation will be key to addressing future engineering challenges and achieving sustainable technological growth.

Student Speak

Mr. Rohan V. Mohite
Student, Third Year Mechanical Engineering
Ashokrao Mane Polytechnic, Vathar Tarf Vadgaon.

Basics of Composite Materials

Composite materials are engineered materials formed by combining two or more distinct constituents, typically a matrix and a reinforcement, to obtain improved properties not achievable by individual materials alone. The matrix binds and protects the reinforcement, while the reinforcement provides strength and stiffness. Based on the matrix used, composites are classified as polymer, metal, or ceramic matrix composites, and reinforcements may be in the form of fibers, particles, or layers. Due to their high strength-to-weight ratio, corrosion resistance, and design flexibility, composite materials are widely used in aerospace, automotive, construction, and other advanced engineering applications.

Composite materials are advanced engineering materials developed by combining two or more physically and chemically different constituents to produce a material with enhanced performance characteristics. The matrix material, such as polymer, metal, or ceramic, holds the reinforcement in position, transfers applied loads, and protects it from environmental and mechanical damage. The reinforcement, commonly in the form of fibers or particles like glass, carbon, or ceramic, significantly improves strength, stiffness, and wear resistance.

Composite materials can be designed by controlling fiber orientation, volume fraction, and layering sequence to achieve specific mechanical and thermal properties. Owing to their lightweight nature, high strength-to-weight ratio, good fatigue life, corrosion resistance, and adaptability in design, composites are extensively used in aerospace, automobile, marine, construction, and biomedical engineering applications.

Composite materials also offer excellent vibration damping, thermal insulation, and resistance to chemical and environmental degradation, making them suitable for harsh operating conditions. Advanced manufacturing techniques such as hand lay-up, filament winding, pultrusion, and resin transfer molding allow precise control over shape and quality of composite components. Despite their advantages, composites have certain limitations, including higher initial cost, difficulty in repair, and complex recycling processes. However, continuous research and development in fiber technology, nano-composites, and sustainable materials are expanding their capabilities and applications. As a result, composite materials play a vital role in modern engineering by enabling lightweight, efficient, and high-performance structures.

Composite materials combine the advantages of different constituents to provide lightweight, strong, and durable engineering solutions. Their tailor-made properties and wide applicability make them essential materials in modern and future engineering applications.

Miss. Najiya A. Sutar
Student, Second Year Mechanical Engineering
Ashokrao Mane Polytechnic, Vathar Tarf Vadgaon.

Introduction of Composite Materials

Composite materials have become an essential class of advanced engineering materials due to their superior mechanical, thermal, and environmental performance. A composite is formed by combining two or more distinct materials typically a high-strength reinforcement embedded within a continuous matrix to achieve properties unattainable by the individual constituents alone. The reinforcement, such as fibers, particles, or whiskers, provides strength and stiffness, while the matrix (polymer, metal, or ceramic) ensures load transfer, structural integrity, and environmental protection. This unique combination allows engineers to tailor composite properties to meet specific functional and structural requirements.Modern composites are broadly categorized into polymer-matrix composites (PMC), metal-matrix composites (MMC), ceramic-matrix composites (CMC), hybrid composites, and sandwich structures. PMCs such as carbon- and glass-fiber reinforced polymers dominate aerospace, automotive, marine, and sporting industries due to their exceptional strength-to-weight ratio and corrosion resistance. MMCs and CMCs are used in high-temperature and high-wear environments, including turbine blades, engine components, and heat-resistant structures. Sandwich composites, consisting of strong face sheets bonded to lightweight cores, provide high bending stiffness at minimum weight, making them ideal for aircraft interiors and lightweight structural panels.

Composite manufacturing processes such as resin transfer molding, filament winding, pultrusion, compression molding, and autoclave curing enable the production of components with complex shapes and optimized properties. Key advantages of composites include low density, customizable stiffness, excellent fatigue resistance, and long service life. However, challenges remain in areas such as high production cost, complex repair procedures, and limited recyclability of thermoset composites.With ongoing advancements in nanocomposites, biodegradable natural-fiber composites, and automated manufacturing technologies, the future of composite materials is increasingly focused on sustainability, high performance, and multifunctionality. As a result, composites continue to play a transformative role in next-generation engineering systems, enabling lightweight design, improved energy efficiency, and enhanced operational reliability across diverse industries.

Industry Speak

Miss. Sayali Mohite
Production Executive,
TATA Motors, Pune

Industry Approch of Composite Materials

Composite materials represent a rapidly advancing class of engineered materials that combine two or more distinct phases—typically a reinforcement phase and a matrix phase—to produce a material with enhanced and customized properties. The reinforcement, often in the form of continuous or discontinuous fibers, particles, or whiskers, imparts high strength, stiffness, and load-bearing capability, while the matrix (polymer, metal, or ceramic) binds the reinforcement, protects it from environmental degradation, and ensures efficient stress transfer. This synergistic combination allows engineers to design materials with high specific strength, superior fatigue behavior, corrosion resistance, and tailored mechanical performance, making composites indispensable in modern engineering.Modern composites can be classified into polymer matrix composites (PMCs), metal matrix composites (MMCs), ceramic matrix composites (CMCs), hybrid composites, and sandwich structures. PMCs such as carbon fiber-reinforced polymers (CFRP) and glass fiber-reinforced polymers (GFRP) are widely used due to their lightweight nature and excellent mechanical properties, making them ideal for aircraft structures, wind turbine blades, sports equipment, and automotive components. MMCs and CMCs are preferred in demanding environments where high temperatures, wear resistance, and dimensional stability are critical, such as gas turbines, aerospace engines, braking systems, and thermal protection systems. Hybrid composites combine different reinforcement types to achieve a balance of performance and cost, while sandwich composites provide exceptional bending stiffness and energy absorption capabilities.The performance of composite materials depends significantly on fiber orientation, volume fraction, interfacial bonding, and manufacturing method. Advanced fabrication techniques— including filament winding, resin transfer molding (RTM), pultrusion, compression molding, additive manufacturing of composites, and high-pressure autoclave curing—enable precise control of material quality, fiber alignment, and complex geometries. Additionally, modern analytical tools and simulation software allow engineers to predict composite behavior under static and dynamic loads, optimize laminate stacking sequences, and evaluate failure modes such as delamination, fiber breakage, and matrix cracking.Composite materials provide lightweight, high-strength, and customizable solutions that drive innovation across modern engineering applications.

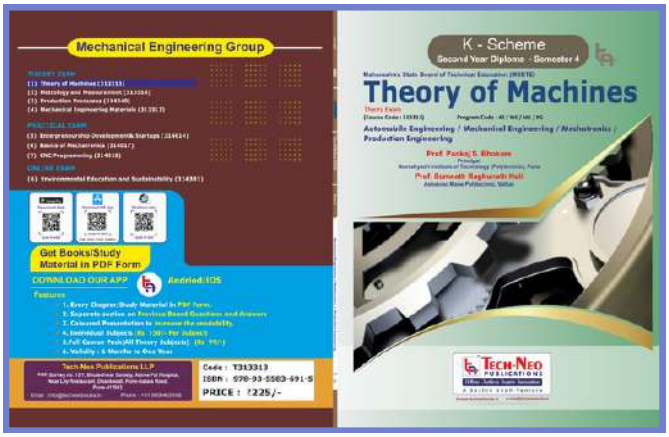
Achievements

Staff Achievements

Mr. S. N. Yadav completed NPTEL course - "Product Design and Development".

Mr. S. R. Koli completed NPTEL course - "Manufacturing Processes-Casting and Joining".

Book Publication



A text book on "Theory of Machines" was published by Mr. S. R. Koli .

A text book on " Thermal Engineering" was published by Mr. S. R. Koli.

Research Paper Publication

Mr. S. R. Koli and Mr. P. S. Patil published a review paper on "Assessment and Attainment Process of Course Outcomes (COs) and Program Outcomes (POs) in Diploma Engineering under MSBTE" in International Research Journal of Education and Technology.

Mr. S. N. Yadav and Mr. S. R. Koli published a review paper on "Industrial Training Experience for Engineering students" in Journal of Emerging Technology and Innovative Research.

Mr. S. N. Yadav has given contribution in preparing MSBTE Lab-Manual and Bilingual Learning Material of subject Industrial Engineering and Quality Control.

Mr. P. S. Patil has given contribution in preparing MSBTE Lab-Manual of subject Automobile Engineering and Bilingual Learning Material of subject Design of Machine Elements.

Student Achievements

Summer Exam 2025

Third Year Mechanical Engineering

Mr. Kamble Adarsh Divakar:82.55%

Mr. Patil Sarvjeet Santosh:82.44%

Miss. Thorat Shravani Maruti:80.55%

Second Year Mechanical Engineering

Miss. Patil Tanvi Shrikant:82.78%

Mr. Koli Prathmesh Sanjay:79.67%

Mr. Mohite Shubham Sarjerao:79.33%

First Year Mechanical Engineering

Miss. Patil Sharyu Shahaji: 87.67%

Miss. Sutar Najiya Amirhamja: 79.68%

Mr. Mane Gaurav Ganesh : 78.72 %

Co-Curricular Activities

Mr. Suraj Sanjay Patil (S. Y. Mech.) Secured third rank in CAD WAR competition orgnised by Sa. Re. Patil Institute of Technology, Shirol.

Second Year Mechanical Engineering student, Mr. Gaurav Ganesh Mane securing 2nd Rank in the Lathe War competition at ORNATE 2k25, organized by Sharad Institute of Technology Polytechnic, Yadrav.

Research Paper Publication

Journal of Emerging Technologies and Innovative Research
An International Open Access Journal Peer-reviewed, Refereed Journal
www.jetir.org | editor@jetir.org An International Scholarly Indexed Journal

Certificate of Publication

The Board of
Journal of Emerging Technologies and Innovative Research (ISSN : 2349-5162)
Is hereby awarding this certificate to
Ms. Tanvi Shrikant Patil
In recognition of the publication of the paper entitled
A Review on Industrial Training Experience for Engineering students

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Certificate of Publication

The Board of
Journal of Emerging Technologies and Innovative Research (ISSN : 2349-5162)
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Ms. Tejashri Sanjay Gondhali
In recognition of the publication of the paper entitled
A Review on Industrial Training Experience for Engineering students

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Certificate of Publication

The Board of
Journal of Emerging Technologies and Innovative Research (ISSN : 2349-5162)
Is hereby awarding this certificate to
Ms. Pranali Santosh Salape
In recognition of the publication of the paper entitled
A Review on Industrial Training Experience for Engineering students

Miss. Tanvi S. Patil, Miss. Tejashri S. Gondhali and Pranali S. Salape published a review paper on "Industrial Training Experience for Engineering students" in Journal of Emerging Technology and Innovative Research.

Other Activities

Workshope on 3D Printing Technology



Workshop on 3D Printing Technology

A workshop on 3D Printing Technology was organized by the Department of Mechanical Engineering on Tuesday, 28/10/2025. The objective of the workshop was to provide students with practical knowledge of rapid prototyping technologies.The workshop proved beneficial in enhancing students' understanding of the working and functioning of 3D printers. Participants were also introduced to the software tools used for generating programs that are fed into 3D printing machines to produce various three-dimensional products. Additionally, students gained exposure to different software applications involved in the 3D printing process.

NSS Activities



Diwali Pharal Distribution to Needy

Under the National Service Scheme (N.S.S.), on behalf of Shri Balasaheb Mane Shikshan Prasarak Mandal, Ashokrao Mane Polytechnic, Vathar, Diwali snacks were distributed to nomadic communities and economically underprivileged individuals. The beneficiaries included sugarcane workers from various districts who migrate from village to village in search of livelihood, as well as truck drivers from the states of Karnataka, Gujarat, Kerala, Madhya Pradesh, and Uttar Pradesh, who transport goods across states and spend several months away from their families during the festive season.

Individuals engaged in multifaceted folk arts within nomadic communities further enriched the festive spirit and doubled the joy of Diwali. With the objective of ensuring that underprivileged individuals who remain away from their families could also experience the joy of the festival, the N.S.S. Department successfully implemented this snack distribution activity with great enthusiasm and social commitment.

Success Story

Mr. Krishna Babulal Malpani,
Alumnus,
Mechanical Engineering, 2018 Batch

I am **Krishna Babulal Malpani**, from Shiroli (Pulachi), Kolhapur, and a proud alumnus of **Ashokrao Mane Polytechnic (AMP), Vathar - Mechanical Engineering, 2018 Batch.** My journey began in 2015 when I decided to take admission in Mechanical Engineering. At that time, I had very little clarity about the different fields available after 10th. It was my sister Sonam, who guided me in the right direction and suggested choosing AMP, as she herself had completed her diploma from this institute. That one decision shaped my entire future.

When I entered AMP, Vathar, I was fortunate to find a wonderful group of friends. We studied together, competed together, and created memories that I cherish even today. The healthy academic competition among us and our active participation in sports, cultural programs, and departmental activities made my diploma journey both exciting and meaningful.

In academics, I consistently strived for excellence and eventually **secured 92.41% in my final year**, which was the **highest score in both the department and the entire college at that time.** Along with studies, I was also active in sports such as **Cricket, Table Tennis, Chess, and Badminton etc.** and won prizes during annual sports events. I also represented the institute at the zonal level, where I had the opportunity to lead my team, an experience that helped me develop qualities like **leadership, teamwork, discipline, problem-solving, and confidence**. In recognition of my all-round performance, **I was honored with the "Best Outgoing Student of 2018 - Mechanical Engineering Department.**" This remains one of the proudest milestones of my academic life.

After completing my diploma, I secured admission to PCCoE, Pune, one of the most reputed engineering colleges in India. There, I explored new learning opportunities, met new friends, and expanded my technical knowledge. After engineering, I pursued CDAC, which opened the doors to the IT industry. Today, I am working as a Software Engineer at Evolent Health International Pvt. Ltd., continuing my journey of growth and learning.

Looking back, I can proudly say that **AMP, Vathar is the foundation of my career.** Everything I am today, my discipline, leadership qualities, communication skills, confidence, and technical mindset was developed during my time at this institute. The support and encouragement from all the staff members played a crucial role in shaping my personality. My diploma friends are still in touch, and I have gained **friends for life.**

I express my sincere gratitude to all my respected teachers, the Mechanical Engineering Department, and Ashokrao Mane Polytechnic, Vathar for guiding me, inspiring me, and supporting me throughout my journey. Whatever I have achieved today is rooted in the values and knowledge I received here.

Thank you, AMP Vathar, for being the strongest pillar of my success.

Theme of Next Issue -
AI and Machine Learning in Mechanical Design

The responsibility of the authenticity of the information in this Newsletter lies with the author. Views expressed by the authors are solely theirs; they are neither the views of Mechanical Engineering Department nor are they endorsed by Mechanical Engineering Department. Queries, comments, feedback and information may be sent to ampvmechdept@gmail.com. Edited, Printed and Published by Mr. S. N. Yadav, H. O. D.-Mechanical Engineering, Ashokrao Mane Polytechnic, Vathar Tarf Vadgaon, 416112,Website - www.amietv.org.