

October 2017

# MECHNOVATION

Igniting Young Minds

MECHANICAL ENGINEERING  
DEPARTMENT

MEERUT INSTITUTE OF  
ENGINEERING TECHNOLOGY

MEERUT INSTITUTE OF ENGINEERING AND TECHNOLOGY

# MECHOVATION

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“Igniting Young minds”

October, 2017

Department Of Mechanical Engineering

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# Mechanical Engineering Department

## Vision of the Department

To become a nationwide recognised department for research oriented quality technical education in line with emerging trends and evolving demands of society.

## Mission of the Department

The mission of mechanical engineering department includes:

1. To embrace excellent teaching learning techniques to provide practical quality education that is commensurate with the emerging trends and industry demands.
2. To promote research in interdisciplinary areas by forging collaborations with global industries and establishing state-of-the-art research facilities in order to develop among students innovative and creative capabilities.
3. To mentor and guide young technocrats and inculcate them with the spirit of entrepreneurship along with ethics, values and eco-sensitivity.

## Program Educational Objectives (PEOs)

After five years from completion of graduation, the student will:

1. Pursue career as practicing mechanical engineer in core mechanical or allied industries worldwide.
2. Meet the expectations of modern industries for catering the proliferating demand and rising quality standards.
3. Become a responsible engineer capable of conducting sustainable, environment-friendly, innovative research and development in advanced domains.
4. Serve the society better by practicing professional leadership roles with a commitment to lifelong learning.
5. Become a person with a strong will and attitude to excel through the challenges in all walks of life.

## Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **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.

4. **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.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **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.
7. **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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **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.
12. **Lifelong 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.

### **Program Specific Outcomes (PSOs)**

#### **Engineering Graduates will be able to:**

1. **PSO 1:** Implement the engineering concepts for generating innovative ideas on design, development and analysis using advanced 3D modelling , manufacturing and simulation tools.
2. **PSO 2 :** Design solutions for complex and time consuming conventional mechanical process through multidisciplinary technologies like PLC, SCADA, Drives and industrial automation with a focus on futuristic technologies like Industry 4.0 and Internet of Things.
3. **PSO 3:** Implement the concepts of automotive technology for troubleshooting, calibrating and testing of various electrical, electronic and fuel supply components of automobiles along with fabrication of SPVs.

## **Design for Manufacturability** *Mr. Nalin Dani (Student, MED)*

**Design for manufacturability (DFM)** is the process of proactively designing products optimize all the manufacturing functions: fabrication, assembly, test, procurement, shipping, delivery, service, and repair, and assure the best cost, quality, reliability, regulatory compliance, safety, time-to-market, and customer satisfaction.

**Concurrent Engineering** is the practice of concurrently developing products and their manufacturing processes. If existing processes are to be utilized, then the product must be design for these processes. If new processes are to be utilized, then the product and the process must be developed concurrently.

Design for Manufacturability and Concurrent Engineering are proven design methodologies that work for any size company. Early consideration of manufacturing issues shortens product development time, minimizes development cost, and ensures a smooth transition into production for quick time to market. These techniques can be used to commercialize prototypes and research.

Quality can be designed in with optimal part selection and proper integration of parts, for minimum interaction problems. By considering the cumulative effect of part quality on product quality, designers are encouraged to carefully specify part quality.

Design for Manufacturability can reduce many costs, since products can be quickly assembled from fewer parts. Thus, products are easier to build and assemble, in less time, with better quality. Parts are designed for ease of fabrication and commonality with other designs. DFM encourages standardization of parts, maximum use of purchased parts, modular design, and standard design features. Designers will save time and money by not having to "re-invent the wheel." The result is a broader product line that is responsive to customer needs.

Companies that have applied DFM have realized substantial benefits. Costs and time-to-market are often cut in half with significant improvements in quality, reliability, serviceability, product line breadth, delivery, customer acceptance and, in general, competitive posture.

## **Top mechanical engineer skills**

*Mr. Amolak Singh (Student, MED)*

1. **Knowledge of materials:** What makes an airplane fly? Light weight material, right? (Yes, there are more things. I'll take some of them below).
2. **CAD softwares:** AutoCAD is where it all starts. We draw a lot of sheets in our engineering classes. Let's just do that with accuracy and neatness, in a format that can be sent anywhere around the world anytime you want. CATIA, SolidWorks, CREO (Pro E) these are some of the most commonly used 3D modelling softwares used by industries. Learn one thoroughly, practice and get a good command on your drawing and modelling.
3. **Thermodynamics:** What makes mechanical engineering so different and interesting? Thermodynamics would be my answer. One should be thorough with all the basics! Even CPUs use heat pipe to dissipate heat. Where is all that innovated from? Thermodynamics and Heat Transfer.
4. **FEA:** Finite Element Analysis. Design and then analyse it. If it's a Formula 1, you're bringing CFD (Computational Fluid Dynamics) into some real action. Motorsports is such an exhilaration, thanks to engineering! Ansys is my favourite of all. Best tool for analysis.
5. **Simulation:** It's an integral part of any design process. MATLAB-Simulink is available for free, you can practice on that.
6. **Automobile:** Although it's a different branch of engineering but mechanical is where it all starts. Follow Motorsports and get inspired from the best engineering.
7. **SAE:** Society of automobile Engineers. It gives you a platform to innovate, learn and compete. Enroll for it, if you haven't and rise in the game.
8. **Mechanics:** Mechanics is the building block of some of the main subjects of mechanical engineering that includes: Strength of materials, Machine Design, Theory of machines etc.
9. **Vehicle Dynamics:** NVH is one field to watch out for.
10. **Motorsports:** F1, WEC, WRC, Moto GP etc. are at the pinnacle of this engineering. Knowing how these machines work won't hurt.
11. **Newspaper:** It's for mankind. Be aware of what's happening around the world and be original with your thoughts and what you believe in.



## Advanced Composite Materials in Aircrafts

*Ms.Ashrita Singh (Student, MED)*

Advanced Composite Materials came in to existence to modify the existing materials in a way that it will enhance the physical and chemical properties of the material. ACMs are necessary in aircraft manufacturing since ACMs are light weight, more strong then conventional materials such as aluminium and fiberglass. The aerospace industry and the manufacturers' unrelenting passion to enhance the performance of commercial and military aircraft is constantly driving the development of improved high performance structural materials. Composite materials are one such class of materials that play a significant role in current and future aerospace components. Composite materials are particularly attractive to aviation and aerospace applications because of their exceptional strength- and stiffness-to-density ratios and superior physical properties. Composite materials in aviation came into existence about 60 years ago when boronreinforced epoxy composite was used for the skins of the empennages of the U.S. F14 and F15 fighters. Although it was only 2% and was used in secondary structures but as development improved its use in primary structures such as fuselage and wings has increased widely. For example – The Airbus A350 XWB (Extra Wide Body) is the first aircraft whose primary structures (wings and fuselage) are completely made out of carbon-fibrereinforced polymer. A350 consists of 53% composites, 19% Al/Al-Li, 14% titanium, 6% steel, and 8% miscellaneous.



Not only has this structure improved the aircraft's performance (weight), but also its maintenance and repair procedures. It has been designed to fulfil in-service requirements with benefits such as increased resistance to accidental ground service impacts, simplified damage assessment processes and proven repair solutions. Advantages of using composite is that they can be formed into more complex shapes then their metallic counterparts, weight reduction, formability, better corrosion resistance and good resistance to fatigue. The B2 stealth bomber requires a radarabsorbing material to be added to the exterior of the aircraft with a concomitant weight penalty. Composite materials are therefore used in the primary structure to offset this penalty.

The strength and stiffness of a composite buildup depends on the orientation sequence of the plies. The practical range of strength and stiffness of carbon fiber extends from values as low as those provided by fiberglass to as high as those provided by titanium. This range of values is determined by the orientation of the plies to the applied load. Proper selection of ply

orientation in advanced composite materials is necessary to provide a structurally efficient design. The part might require  $0^\circ$  plies to react to axial loads,  $\pm 45^\circ$  plies to react to shear loads, and  $90^\circ$  plies to react to side loads. Because the strength design requirements are a function of the applied load direction, ply orientation and ply sequence have to be correct. It is critical during a repair to replace each damaged ply with a ply of the same material and ply orientation. This makes carbon fiber quasi-isotropic in nature.

## Underwater Turbine

*Mr. Nitin Sharma (Student, MED)*

There are a lot of renewable energy resources sources which are used to obtain energy such as the solar energy obtained by placing solar panels, wind energy obtained by placing windmills on fields so that by wind energy it will give rise to rotation of blades and producing electricity further. Similarly this new technique has been coming into practice to the coastal areas where the turbine blades which are used for the wind energy purpose are placed underwater near the coastal areas. Because the coastal area receives the high and low tides due to the gravitational effect by sun and moon and the rotation of earth. Ocean currents have the tendency to produce more currents as oceans are denser than air (they are 832 times more dense than air), due to which it applies greater force on turbines.

Tidal energy can be produced by many technologies, the major ones are:

- Tidal barrages
- Tidal fences
- Tidal turbines

Hence tidal has one very distinct benefit it is virtually 100% predictable as unlike windmills which are criticized for spoiling the views on land. With underwater turbines you cannot hear it or see it and hence they are very environmentally beloved and do not produce any noise.



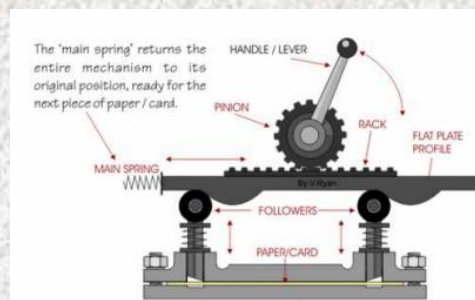
## Cam and follower

*Mr. Adamy Aggarwal (Student, MED)*

A cam is a rotating machine element which gives reciprocating or oscillating motion to another element known as follower. The cam and follower have a point or line contact constituting a higher pair. The contact between them is maintained by an external force which is generally provided by a spring or sometimes by the weight of the follower itself when it is sufficient. The cam converts rotary motion of one element into reciprocating (linear) motion or into oscillatory motion. The cam is the driver member and the follower is the driven member. Cam followers are often used on conveyors, process transfer lines, such as those used in industries such as food and beverage, plastics, glass and among others. AST cam followers are also popular for defense and aircraft applications, where maintainability and system reliability are important design considerations. To smoothly and evenly distribute the loads, cam followers usually are designed with a full complement of rolling elements. However, there is more than one type of configuration for cam is mounted to its counterpart.

Future trends to reduce, control and overcome scuffing in cam-follower system are recommended, such as:

1. The future for improved scuffing resistance of cams and their followers lies with the field of surface coating, cladding treatments, metallic material composite and multi-layer soft materials.
2. In designing to avoid failure by scuffing in cam-follower system, factors must be taken into considerations such as rich lubrication, low contact temperature, material selection and processing.
3. Surface roughness value and texture play an important role in scuffing mechanism. Therefore, it ought to be taken into consideration during manufacturing process of cam-follower system.
4. The adequate choice of properties of lubrication; such as viscosity, friction etc. Therefore, if economics allow, the modern lubricants such as the liquid crystal and electro rheological fluid may be used.



# Relaxation Techniques That Zap Stress Fast

*(Student, MED)*

Relax. You deserve it, it's good for you, and it takes less time than you think.

You don't need a spa weekend or a retreat. Each of these stress-relieving tips can get you from OMG to om in less than 15 minutes.

## 1. Meditate

A few minutes of practice per day can help ease anxiety. "Research suggests that daily meditation may alter the brain's neural pathways, making you more resilient to stress," says psychologist Robbie Maller Hartman, PhD, a Chicago health and wellness coach.

It's simple. Sit up straight with both feet on the floor. Close your eyes. Focus your attention on reciting -- out loud or silently -- a positive mantra such as "I feel at peace" or "I love myself." Place one hand on your belly to sync the mantra with your breaths. Let any distracting thoughts float by like clouds.

## 2. Breathe Deeply

Take a 5-minute break and focus on your breathing. Sit up straight, eyes closed, with a hand on your belly. Slowly inhale through your nose, feeling the breath start in your abdomen and work its way to the top of your head. Reverse the process as you exhale through your mouth.

"Deep breathing counters the effects of stress by slowing the heart rate and lowering blood pressure," psychologist Judith Tutin, PhD, says. She's a certified life coach in Rome, GA.

## 3. Be Present

Slow down.

"Take 5 minutes and focus on only one behavior with awareness," Tutin says. Notice how the air feels on your face when you're walking and how your feet feel hitting the ground. Enjoy the texture and taste of each bite of food.

When you spend time in the moment and focus on your senses, you should feel less tense.

## 4. Reach Out

Your social network is one of your best tools for handling stress. Talk to others -- preferably face to face, or at least on the phone. Share what's going on. You can get a fresh perspective while keeping your connection strong.

## 5. Tune In to Your Body

Mentally scan your body to get a sense of how stress affects it each day. Lie on your back, or sit with your feet on the floor. Start at your toes and work your way up to your scalp, noticing how your body feels.

## **Stress: 10 Ways to Ease Stress** *(Student, MED)*

Stress refers to your body's reaction to challenges and demands. Stress can be positive or negative and there are healthy ways to deal with it. Sleeping well is important in stress management.

### **What is stress?**

Stress is the body's response to a challenge or demand. Everyone experiences stress, which can be triggered by a range of events, from small daily hassles to major changes like a divorce or job loss. The stress response includes physical components such as an elevated heart rate and blood pressure, thoughts and personal beliefs about the stressful event, and emotions, including fear and anger. Although we often think of it as being negative, stress can also come from positive changes in your life, like getting a promotion at work or having a new baby.

### **How can we handle stress in healthy ways?**

Stress serves an important purpose—it enables us to respond quickly to threats and avoid danger. However, lengthy exposure to stress may lead to mental health difficulties (for example, anxiety and depression) or increased physical health problems. A large body of research suggests that increased stress levels interfere with your ability to deal with physical illness. While no one can avoid all stress, you can work to handle it in healthy ways that increase your potential to recover.

1. **Eat and drink to optimize your health.** Some people try to reduce stress by drinking alcohol or eating too much. These actions may seem to help in the moment, but actually may add to stress in the long run. Caffeine also can compound the effects of stress. Consuming a healthy, balanced diet can help to combat stress.
2. **Exercise regularly.** In addition to having physical health benefits, exercise has been shown to be a powerful stress reliever. Consider non-competitive aerobic exercise, strengthening with weights, or movement activities like yoga or Tai Chi, and set reasonable goals for yourself. Aerobic exercise has been shown to release endorphins—natural substances that help you feel better and maintain a positive attitude.
3. **Stop using tobacco and nicotine products.** People who use nicotine often refer to it as a stress reliever. However, nicotine actually places more stress on the body by increasing physical arousal and reducing blood flow and breathing.
4. **Study and practice relaxation techniques.** Taking the time to relax every day helps to manage stress and to protect the body from the effects of stress. You can choose from a variety of techniques, such as deep breathing, imagery, progressive muscle relaxation, and mindfulness meditation. There are many online and smart phone apps that provide guidance on these techniques; although some entail purchase costs, many are available free of charge.
5. **Reduce triggers of stress.** If you are like most people, your life may be filled with too many demands and too little time. For the most part, these demands are ones we have chosen. You can free up time by practicing time-management skills like asking

for help when it's appropriate, setting priorities, pacing yourself, and reserving time to take care of yourself.

6. **Examine your values and live by them.** The more your actions reflect your beliefs, the better you will feel, no matter how busy your life is. Use your values when choosing your activities.
7. **Assert yourself.** It's okay to say "No" to demands on your time and energy that will place too much stress on you. You don't have to always have to meet the expectations of others.
8. **Set realistic goals and expectations.** It's okay—and healthy—to realize you cannot be 100% successful at everything all at once. Be mindful of the things you can control and work on accepting the things that you can't control.
9. **Sell yourself to yourself.** When you're feeling overwhelmed, remind yourself of what you do well. Have a healthy sense of self-esteem.

There are several other methods you can use to relax or reduce stress, including:

- Deep breathing exercises.
- Meditation.
- Mindfulness meditation.
- Progressive muscle relaxation.
- Mental imagery relaxation.
- Relaxation to music.
- Biofeedback (explained below).
- Counseling, to help you recognize and release stress.

Ask your healthcare provider for more information about these techniques or other suggestions.

### **Biofeedback**

Biofeedback helps a person learn stress reduction skills by providing information about muscle tension, heart rate, and other vital signs as a person attempts to relax. It is used to gain control over certain bodily functions that cause tension and physical pain.

Biofeedback can be used to help you learn how your body responds in stressful situations, and how to cope better. If a headache, such as a migraine, begins slowly, many people can use biofeedback to stop the attack before it becomes full-blown.

### **What to do if you have trouble sleeping**

You may experience insomnia (an inability to sleep) because of discomfort, stress from personal concerns, or side effects from your medications. If you cannot sleep, try these tips:

- Establish a regular sleep schedule – go to bed and get up at the same time every day.
- Make sure your bed and surroundings are comfortable. Arrange the pillows so you can maintain a comfortable position.
- Keep your bedroom dark and quiet.
- Use your bedroom for sleeping only. Don't work or watch TV in your bedroom.
- Avoid napping too much during the day. At the same time, remember to balance activity with periods of rest.

- If you feel nervous or anxious, talk to your spouse, partner, or a trusted friend. Get your troubles off your mind.
- Listen to relaxing music.
- Do not rely on sleeping pills. They can be harmful when taken with other medications. Use them only if recommended for a brief period by your healthcare provider if other non-medication methods don't work.
- Take diuretics, or "water pills," earlier if possible, so you don't have to get up in the middle of the night to use the bathroom.
- If you can't sleep, get up and do something relaxing until you feel tired. Don't stay in bed worrying about when you're going to fall asleep.
- Avoid caffeine.
- Maintain a regular exercise routine, but don't exercise within two to three hours before the time you go to bed.



## ***Message from Editorial Team***

It is our immense pleasure that we were given the opportunity to work on the issue of the department magazine 'Mechnovation: Igniting Young Minds'. As we know a magazine mirrors a department & its vision and mission. This Edition highlights on personal development, tips to fight stress. We would like to thank our faculty members and friends for their support in creation of this issue. I do hope the magazine will give message for motivation to students to use it as a platform to present their creativity and ideas. We welcome all valuable suggestions for continuous improvement.

### **Student Editorial Team**

Mr. Shubham Namdev  
Mr. Vineet Upadhyay

### **Faculty Advisor**

Mr. Rahul Sharma (Assistant Professor, MED)  
Mr. Mahendra Singh Tomer (Assistant Professor, MED)

**THANK YOU**

