IARE

INSTITUTE OF AERONAUTICAL ENGINEERING

NAAC ACCREDITATION A++ GRADE

24 YEARS OF Excellence

nirf INDIA RANKINGS ENGINEERING CATEGORY RANK 151-200 INNOVATION CATEGORY RANK 51-100

NBA NATIONAL BOARD OF ACCREDITATION

A MECHANICAL ENGINEER IS ABLE TO DO EVERYTHING

B.TECH

MECHANICAL ENGINEERING

ACADEMIC YEAR 2024-25

VISION AND MISSION OF THE INSTITUTE

VISION

To bring forth students, professionally competent and socially progressive, capable of working across cultures meeting the global standards ethically.

MISSION

To provide students with an extensive and exceptional education that prepares them to excel in their profession, guided by dynamic intellectual community and be able to face the technically complex world with creative leadership qualities.

Further, be instrumental in emanating new knowledge through innovative research that emboldens entrepreneurship and economic development for the benefit of wide spread community.

VISION AND MISSION OF THE DEPARTMENT

VISION

The Department of Mechanical Engineering envisions value-based education, research, and development in the areas of Manufacturing and Computer Aided Engineering as an advanced center for Mechanical Engineering, producing graduates of world-class competence to face the challenges of global market with confidence, creating effective interface with various organizations.

MISSION

The mission of the Mechanical Engineering Department is to prepare effective and responsible engineers for global requirements by providing quality education and to improve pedagogical methods employed in delivering the academic programs to the needs of the industry and changing world by conducting basic and applied research and to generate intellectual property.

M1: Prepare effective and responsible engineers for global requirements by providing quality education.

M2: Improve pedagogical methods employed in delivering academic program to the needs of the industry, prepare for higher education and building entrepreneurship.

M3: Conduct basic and applied research to generate intellectual property and adapt to professional standards.

Program Educational Objectives (PEOs)

PEO-I

To provide students with a sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze engineering problems.

PEO-II

To prepare students for successful careers in industry that meet the needs of local, Indian and multinational companies.

PEO-III

To develop the ability among students to synthesize data and technical concepts for application to product design and prepares students to work as part of teams on multidisciplinary projects.

PEO-IV

To promote student awareness for life-long learning and to introduce them to codes of professional practice, ethics and prepare them for higher studies.

Knowledge and Attitude Profile

WK1

A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2

Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3

A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4

Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5

Knowledge, including efficient resource use, environmental impacts, whole-life cost, reuse of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6

Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7

Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8

Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9

Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes (POs)

PO-1 Engineering Knowledge

Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO-2 Problem Analysis

Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO-3 Design/Development of Solutions

Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO-4 Conduct Investigations of Complex Problems

Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO-5 Engineering Tool Usage

Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO-6 The Engineer and The World

Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO-7 Ethics

Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO-8 Individual and Collaborative Team work

Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO-9 Communication

Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO-10 Project Management & Finance

Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multi disciplinary environments.

PO-11 Life-Long Learning

Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes (PSOs)

PSO-I

Focus on Ideation and Research towards Digital manufacturing in Product development using Additive manufacturing, Computer Numerical Control (CNC) simulation and high-speed machining.

PSO-II

Formulate and Evaluate concepts of Thermo-Fluid Systems to provide solutions for Inter Disciplinary Engineering Applications.

PSO-III

Make use of Computational and Experimental tools for Building Career Paths towards Innovation Startups, Employability and Higher Studies.

ABOUT **Mechanical Engineering**

The field of mechanical engineering is incredibly diverse and encompasses a wide range of topics related to the design, analysis, manufacturing, and maintenance of mechanical systems. Mechanical engineers apply principles of physics and materials science to develop everything from tiny microdevices to massive machinery.

Electronics and Communication Engineering (ECE) department is to impart knowledge and skills related to the design, development, and application of electronic systems and communication technologies. This field focuses on the study of electronic devices, circuits, communication systems, and their integration to create innovative solutions for various industries and sectors. Provide students with a strong foundation in electronic principles, digital and analog circuits, signal processing, communication systems, and related areas

The goals of Electronics and Communication Engineering (ECE) revolve around advancing technology, fostering innovation, and addressing societal needs.

Why study here Mechanical @ IARE

- Well trained experts in areas of advanced manufacturing, thermal engineering and robotics.
- Well-equipped laboratory facilities and conducive environment for students.
- International exposure for students via mobility program and student exchange.
- Industry supported laboratories.

EXPERTISE AND FOCUS:

Mechanical Engineering is a dynamic field that encompasses the design, analysis, and manufacturing of mechanical systems, ranging from micro-scale devices to massive industrial machinery. The core expertise and focus areas within the realm of mechanical engineering are:

Relevant high demands of research focus:

1. Design and Analysis
2. Materials and Manufacturing
3. Thermodynamics and Heat Transfer
4. Dynamics and Control Systems
5. Robotics and Automation
6. Automotive Engineering
7. Aerospace Engineering
8. Renewable Energy Systems
9. Biomechanics and Medical Devices

DEPARTMENT **SPECIFIC LABORATORIES**

Mechanical engineering stands as one of the broadest and most versatile engineering disciplines, encompassing various fields such as robotics, automotive engineering, aerospace, materials science, and more.

ADVANCED MANUFACTURING LABORATORY:

This laboratory focuses on additive manufacturing, CNC machining, and advanced material processing techniques. Equipped with 3D printers, CNC machines, and laser cutting tools, researchers here explore novel fabrication methods, material compositions, and manufacturing processes to enhance efficiency, reduce costs, and improve product quality.

CNC Vertical Machining Center

Milling, lathing, and drilling operations on a single machine tool allows one machine to perform a greater variety of machining needs. The main purpose of the CNC machine center is to reduce production time and facilitate research in advanced mechanisms in the CNC technology.

Specifications:

- → Ace Micrometric make with 6 tool post
- → Fanuc Operating System with Tool Shank BT-30
- → X/ Y/ Z AXIS 300/ 250/ 250 mm

CNC Turning Center

CNC technology is widely used in the manufacturing industry. By applying CNC technology to theCNC lathe processing, the accuracy of parts can be effectively improved and the quality of parts processing can be ensured. The development of the mechanical manufacturing industry and the improvement of manufacturing capabilities create good conditions.

Specifications:

- → Make of Lokesh Machine tools with TL 160
- → Distance between centres is 160 mm
- → Six turret tool post

3D Printer

The main advantages of 3D printing are realized in its Speed, Flexibility, and Cost benefits. For small production runs, prototyping, small business, and educational use, 3D printing is vastly superior to other industrial methods. A total of five 3D Printers are available.

Specifications:

- → Make Ultimaker 2 plus
- → Build volume of 200X150 mm
- → PLA and ABS Raw Materials

Universal Grinding Machine

The ECO-200 micromatic industry standard universal cylindrical grinding machine and Johnson shipman are used for grinding of components up to an accuracy of 0.5um and used for projects and consultancy.

Specifications:

- → Ace Micromatic make Eco 200
- → Transverse between centres is 160 mm
- → Upto 2 Micron surface finish

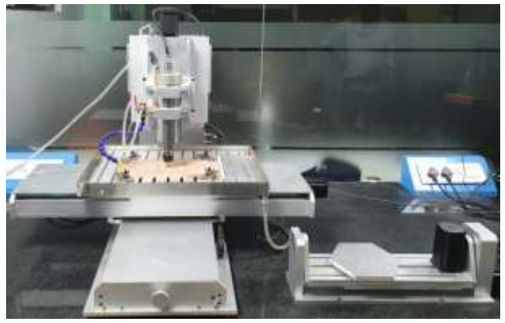
DEPARTMENT **SPECIFIC LABORATORIES**

CNC 5 Axis Vertical Machining Centre

Presently, the CNC 5-axis machine issued for building the NACA Series Aerofoil models for aerodynamic testing. The machine is utilized for aluminum, teflon and wood materials.

Specifications:

- → Make HY-6040 5 Axis CNC Routers, 2.2 KW
- → Repositioning Accuracy : 0.01mm
- → Resolution : 0.02 mm, Processing Speed : 0-4000 mm/min, Z Axis Working Area : 150 mm



ROBOTICS AND AUTOMATION LABORATORY

In this laboratory, researchers delve into the development of autonomous systems, robotic manipulators, and machine learning algorithms. Equipped with robotic platforms, motion capture systems, and simulation software, researchers study human-robot interaction, navigation algorithms, and swarm robotics for applications in industry, healthcare, and space exploration.

6-Axis Robotic Arm

A 6-axis articulated Pick and Place robotic arm of industrial design, for training and research and is manufactured to industrial standards. The robot can lift upto 2.5kg payload. The robot can be used with pneumatic / electrical grippers along with AristoSim Software.

Specifications:

- → Make MTAB ARISTO is a 6 axis articulated robotic arm
- → Payload of 2.5kg
- → 180 Degrees rotation

FANUC Simulator

The FANUC CNC Simulator brings the CNC control right into the classroom, providing students with exposure to FANUC CNC controls without the need for a full machine. The FANUC CNC Simulator is based on the FANUC Series 0i – MODEL F platform and can be started up in either milling or turning configurations.

Specifications:

- → Make of MTAB FANUC Oi-F 3 axis Mill or 2 axis Lathe, switchable at reboot.
- → Pentium Processor N4200 1.1Ghz Quad core, 8GB RAM, 32GB SSD.
- → Ports: 4 USB 3.0

Laser Engraving Machine

EVA-43 laser engraving is a process that utilizes advanced laser technology to etch designs, patterns, or text onto various materials with precision and detail. The "EVA-43" likely refers to a specific model or type of laser engraving machine. Overall, EVA-43 laser engraving offers a versatile and precise method for adding decorative or functional markings to a wide range of materials, making it popular in industries such as manufacturing, signage, jewelry making, and personalized gifts.

Specifications:

- → Make Mehta CADCAM EVA 43
- → Maximum cutting thickness of arcylic – 25mm.
- → Z- AXIS Automatic Up to 180 mm (optional)

Hydraulic Trainer

A hydraulic trainer kit is an educational tool designed to teach principles and applications of hydraulic systems, often used in engineering and technical training programs. A hydraulic trainer kit serves as a valuable tool for students, technicians, and engineers to gain a comprehensive understanding of hydraulic systems and develop the skills necessary for designing, operating, and maintaining these systems in various industrial applications.

Specifications:

- → Make Shiva Hydraulics Installation Horizontal Ambient temperature 60°C Max.
- → Medium Oil VG68 Max. Operating Pressure (Recommended) 20 bar
- → Materials of construction Aluminium, Brass, Steel, Nitrile rubber, Acetyl

DEPARTMENT **SPECIFIC LABORATORIES**

THERMAL FLUID SCIENCES LABORATORY

This laboratory focuses on research related to heat transfer, fluid dynamics, and thermodynamics. With experimental setups, computational fluid dynamics (CFD) software, and thermal imaging equipment, researchers investigate phenomena such as convective heat transfer, turbulence, and multiphase flows. Applications range from optimizing energy systems to enhancing thermal management in electronic devices.

MATERIALS CHARACTERIZATION FACILITY

Dedicated to the characterization of materials at the micro- and nano-scale, this facility houses advanced equipment such as Fatigue Testing Machine and Pin-on-disc. Researchers utilize these tools to analyze material properties, investigate failure mechanisms, and design new materials for applications in structural engineering, nanotechnology, and biomaterials.

Rotating Beam Fatigue Tester

The Fatigue analysis determines the material capability to withstand alternate (cyclic) loading. Based on the design of the specimen or structure the need of the fatigue test is identified. In fatigue test due to continuous loading and unloading leads to formation of tensile, bending, torsional, compression or may be combination.

Pin-On-Disc

A pin-on-disc is a device used to study the parameters between two surfaces such as coefficient of friction, frictional force and wear. It works through a system of masses, a hanging mass and a mass resting on a horizontal surface, both connected by a string and pulley. The pin-on-disc is used to study both static and dynamic friction of the contact surfaces.

COLLABORATIVE SPACES

Beyond specialized laboratories, the Mechanical Engineering Department provides collaborative spaces where researchers from different disciplines converge to exchange ideas and work on interdisciplinary projects.

Makerspace

The Innovation Hub serves as a dynamic workspace where researchers, industry partners, and entrepreneurs collaborate on innovative projects. Equipped with flexible workstations, brainstorming areas, and prototyping facilities, this space fosters creativity, facilitates knowledge exchange, and accelerates the translation of research into real-world solutions.

MAJOR SOFTWARES AVAILABLE

SOLIDWORKS

The facility created by having Solid Works 2020, provides the platform for designing 3D and 2D assembly along with part drawings of student-innovative projects.

CATIA

Catia is computer aided design software developed and marketed by a French company, Dassault Systems. It has gained more popularity in the field of aeronautical engineering though it is used as design software in the field of mechanical and civil engineering. It is also a multi-platform software that provides interface between computer aided design, computer aided engineering, PLM and additive manufacturing.

AUTOCAD

AutoCAD is a software developed and marketed by Autodesk Inc, an American multinational software corporation. This software is used by aeronautical engineers, architecture firms, civil engineers, and mechanical engineers for computational drafting as well as computer aided design purposes.

ANSYS

Ansys is a computer aided engineering software that is developed and marketed by Ansys Inc. It is also one of the common software that is preferred by an engineering graduate student, capable of multi-physics engineering solutions through numerical methods. It offers both implicit and explicit solvers such as AutoDyn, LS-Dyna etc.

MATLAB

MATLAB is a technical computing and high-performance language developed by MathWorks. It is a multi-disciplinary language used in every scientific domain. It is a polyvalent language that offers basic matrix manipulations to advanced level application interfaces. It does provide interface with other computing languages.

CADEM

Software for the mechanical design of pressure vessels, storage tanks, heat exchangers, reactors, agitators, mixing vessels etc.

ARISTOSIM

Software for robot programming and simulation. Ready-made applications are available to train the user in the operations of the robot such as movement, programming and code generation. This software gives you the flexibility to design your applications and import them into the software for simulation. ARISTOSIM has graphics which enable you to visualize the robot from various angles as the robot moves in the simulated application.

Laboratory **Details**

1 Machine Drawing through Cad Laboratory

Machine drawing is intended to communicate the necessary technical information required for manufacture and assembly of machine components. Students practice the development of drawings of machine components as per Bureau of Indian Standards (BIS) and assembly using industry leading mechanical design software's.

Major Equipment

NI Analog Discovery trainer kit- 36 Nos

Make: Dell
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD/NO ODD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse
Software: AutoCAD

2 Materials and Solid Mechanics Laboratory

This laboratory course concerned with the micro structures of both ferrous and nonferrous materials, mechanical properties of materials such as percentage elongation, modulus of elasticity, hardness of materials, modulus of rigidity etc. Investigating the mechanical properties of materials are highly important before going to fabrication of products for yielding the higher performance.

Major Equipment

Universal testing machine
Make: HITECH INDIA
Model: UTK-40

Computerized Universal Testing Machine
Make: HITECH INDIA
Model: UTK-40

Metallurgical Micro Scope
Make: HITECH INDIA
Model: 13ASME Grain Size Measurement 1014X Eye Piece

Mechanical extensometer
Make: HITECH INDIA
Model: DVC

2 Manufacturing Processes Laboratory

Manufacturing Processes laboratory is intended to enhance the learning experience of the students with new tools, equipment, and techniques for creating physical objects and mechanisms with a variety of materials.

Major Equipment

Hydraulic press Capacity
Make: Hi Tech Hydraulics
Model: 15 HP

Electric Furnace
Make: S V Heat Engineering
Model: Melting capacity - 5Kg

Spot welding Machine
Make: Gemco
Model: Power 6 KW

Sand testing equipment
Make: Metsonic
Model: 0142

2 Fluid Mechanics and Hydraulic Machines Laboratory

The purpose of this laboratory is to strengthen and enhance the understanding of the basics of fluid mechanics and Hydraulic machines. The experiments here are designed to demonstrate the applications of the basic mechanics principles and to provide a lot of intuitive and physical understanding of the theory.

Major Equipment

Pelton turbine test rig
Make: Consolidated Engineering services
Model: 15 HP

Kaplan turbine test rig
Make: Consolidated Engineering services
Model: 15 HP

Francis turbine test rig
Make: Consolidated Engineering services
Model: 15 HP

2 Applied Thermodynamics Laboratory

Applied thermodynamics laboratory is intended to study the working principle of internal combustion engines (both SI and CI engines), performance and characteristics in terms of heat balancing, economical speed variations, air fuel ratio influence on the engine to reinforce classroom theory by having the student perform required tests, analyze subsequent data, and present the results in a professionally prepared report.

Major Equipment

4 strokes Multi cylinder, petrol engine with hydraulic dynamometer test rig
Make: Devale Engineering
Model: Petrol engine

4 strokes Multi cylinder, petrol engine with hydraulic dynamometer testrig
Make: Devale Engineering
Model: Petrol engine

Air compressor test rig
Make: Devale Engineering
Model: Two Stage Two Cylinders

Old engines for assembly and disassembly
Make: Devale Engineering
Model: Old engines

2 Machine Tools and Metrology Laboratory

It is designed to impart the practical knowledge about the various machining processes like turning, shaping, planning, drilling, milling and grinding to produce desired shape of a product. This course introduces the metrological equipment to measure form and positional accuracy of manufactured/machined components and to interpret the results.

Major Equipment

Milling machine
Make: Bharat Fritz Werner Ltd
Model: VF 2

Lathe machine
Make: Anil Engineering Works
Model: AGL-1

Surface grinding
Make: Voltas
Model: 540

2 Theory of Machines laboratory

Theory of Machines laboratory course provides a valuable opportunity for students to apply theoretical knowledge, develop practical skills, and gain a deeper understanding of machine behavior and functionality through hands-on experimentation and analysis.

Major Equipment

Universal Vibration apparatus
Make: Scientific Enterprises
Model: Scientific Enterprises

Journal bearing apparatus
Make: Scientific Enterprises
Model: Scientific Enterprises

Mechanism models
Make: Scientific Enterprises
Model: Scientific Enterprises

2 Heat Transfer Laboratory

Heat transfer laboratory is intended to enhance the learning experience of the student about the flow of thermal energy due to temperature difference and the subsequent temperature distribution changes. This laboratory focuses on heat transfer modes, boundary conditions, one dimensional steady and unsteady state condition and heat exchangers.

Major Equipment

Stefan boltzman apparatus
Make: Mechtrix Engineering
Model: Mechtrix Engineering

Emissivity apparatus
Make: Mechtrix Engineering
Model: Mechtrix Engineering

Pinfin apparatus
Make: Mechtrix Engineering
Model: Mechtrix Engineering

Thermal conductivity of given metal rod
Make: Mechtrix Engineering
Model: Mechtrix Engineering

2 Thermo – Fluid Modelling and Simulation Laboratory

This laboratory course provides learners, the practical knowledge on Ansys Workbench and its different modules. The students will get the hands-on experience to validate their theoretical design ideas to provide solutions to real-world problems.

Major Equipment

Make: Intel
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5 12400 Processor, 16 GB DDR4 RAM, 512 GB SSD/NO ODD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse
Software Available: Ansys.

2 CAD / CAM Laboratory

A CAD/CAM laboratory provides students with practical skills in product development, manufacturing, and prototyping, preparing them for careers in various industries such as aerospace, automotive, electronics, and consumer goods.

Major Equipment

Make: Intel
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD/NO ODD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse

2 Instrumentation Control Systems & Production Drawing Practice Laboratory

An Instrumentation Control Systems & Production Drawing Practice Laboratory offers students hands-on experience in instrumentation, control systems, and production drawing techniques.

Calibration of photo magnetic pickups
Make: Devale Engineering
Model: 046

Calibration of photo magnetic pickups
Make: Devale Engineering
Model: 047

Calibration of RTD
Make: Devale Engineering
Model: 048

Make: Intel
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD/NO ODD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse
Software Available: AutoCAD.

FACULTY **INFORMATION**

Dr. Ch Sandeep

Associate Professor & Head

Ph.D (2014), Doctoral Degree,
(University of Hyderabad, Hyderabad)

M.Tech (2001), Vellore Institute of Technology, Vellore

B.Tech (1999), JNTU , Vijayawada

AREA OF SPECIALIZATION

Heat transfer
Renewable Energy
Material Science

Dr. C Labesh Kumar

Assistant Professor & Deputy Head

Ph.D (2023), Doctoral Degree,
Saveetha University, Chennai

M.Tech (1991), JNTUH, Hyderabad

B.Tech (1984), JNTUH, Hyderabad

AREA OF SPECIALIZATION

Advanced manufacturing Techniques
Design and Optimization
Smart and Composite Materials
Materials characterization
Finite Element Analysis

Dr. V V S Harnadh Prasad

Professor

Ph.D (2014), Doctoral Degree,
Osmania University, Hyderabad

M.Tech (2002), JNTUH, Hyderabad

B.Tech (1993),
The Institution of Engineers, Calcutta

AREA OF SPECIALIZATION

Advanced manufacturing Techniques
Thermal Engineering
Design and Optimization

Dr. GVR Seshagiri Rao

Professor

Ph.D (2018), Doctoral Degree,
JNTUK, Kakinada

M.Tech (2005), JNTUH, Hyderabad

B.Tech (1997),
The Institution of Engineers, Calcutta

AREA OF SPECIALIZATION

Design and Optimization
Material Science
Manufacturing
t Objective Quality
Measures Using Hybrid Wavelet
Thresholding Green communication in
wireless power consumption

Dr. K Viswanath Allamraju

Professor

Ph.D (2017), Doctoral Degree,
NIT, Warangal

M.Tech (2006),
Maulana Azad National Institute of Technology, Bhopal

B.Tech (2003), The Institution of Engineers, Calcutta,

AREA OF SPECIALIZATION

Mathematical modeling
Smart and Composite Materials
Energy harvesting
Vibration Analysis
Finite Element Analysis

Dr. Paidi Raghavulu

Professor

Ph.D (2021), Doctoral Degree,
SV University, Tirupathi

M.Tech (2006), SV University, Tirupathi

B.Tech (1999),
SV University, Tirupathi

AREA OF SPECIALIZATION

Industrial Engineering

Dr. KRaghu Ram Mohan Reddy

Associate Professor

Ph.D (2021), Doctoral Degree,
Andhra university, Visakhapatnam

M.Tech (2011), AU, Visakhapatnam

B.Tech (2006), JNTUK, Kakinada

AREA OF SPECIALIZATION

Coatings
Wear
Corrosion
Heat treatment

Dr. K China Apparao

Associate Professor

Ph.D (2021), Doctoral Degree,
NIT, Silchar

M.Tech (2007), Rajiv Gandhi Proudyogiki
Vishwavidyalaya, Bhopal

B.Tech (1984), A U, Visakhapatnam

AREA OF SPECIALIZATION

Casting
Grain refinement
Composites

Dr. A Naveen Krishna

Assistant Professor

Ph.D (2021), Doctoral Degree,
IIT Bombay, Mumbai

M.Tech (2015), NIT, Trichy

B.Tech (2012), OU, Hyderabad

AREA OF SPECIALIZATION

Healthcare access
Spatial analysis
Location optimization
Public health

Dr. S Sathees Kumar

Associate Professor

Ph.D (2021), Doctoral Degree,
Anna University, Chennai

M.Tech (2015), Anna University, Chennai

B.Tech (2012), Anna University, Chennai

AREA OF SPECIALIZATION

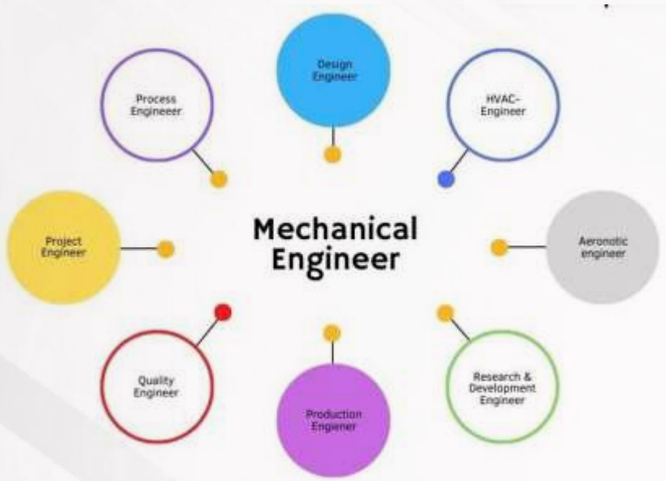
Polymer composites
Natural fiber composites
Design and optimization
Materials characterisation

Assistant **Professors**

Dr. G Hima Bindu
Mr. A Somaiah
Mr. G Sarat Raju
Mr. V Mahidhar Reddy
Mr. M Sunil Kumar
Mr. B Vijaya Krishna
Mr. P Venkata Mahesh
Mr. D Atchuta Ramacharyulu

What Mechanical Engineers do?

Mechanical engineers design power-producing machines, such as electric generators, internal combustion engines, and steam and gas turbines, as well as power-using machines, such as refrigeration and air-conditioning systems.



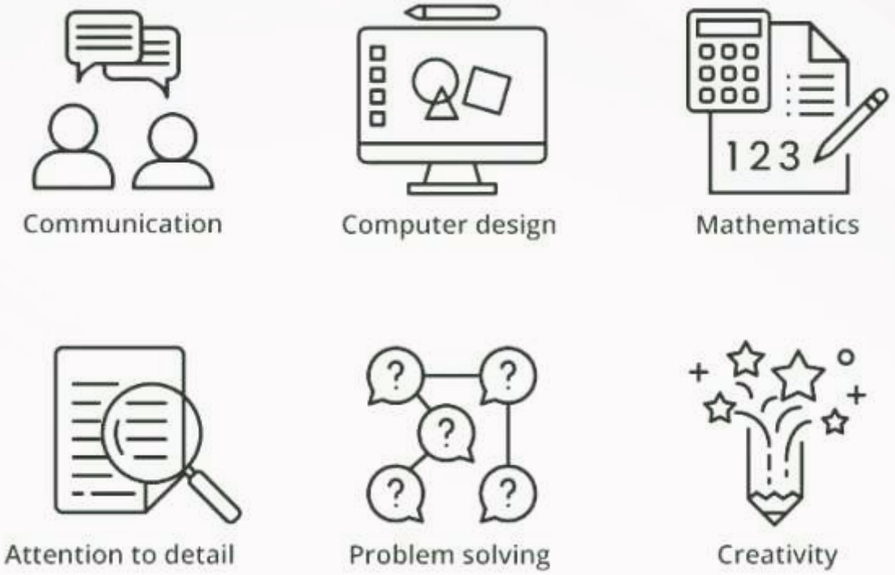
1. Equipment design and development: Mechanical engineers design and develop equipment and machinery for oil and gas exploration, production, and transportation..

2. Maintenance and repair: Mechanical engineers are responsible for maintaining and repairing the equipment and machinery used in the oil and gas industry.

3. Safety and regulatory compliance: Mechanical engineers must ensure that all equipment and machinery used in the oil and gas industry meets safety and regulatory standards. Project management: Mechanical engineers may also be responsible for managing projects related to the design, development, and implementation of new equipment and machinery..

4. Research and development: Mechanical engineers in the oil and gas industry may also be involved in research and development efforts to improve the efficiency and effectiveness of equipment and machinery used in oil and gas exploration, production, and transportation

Skills Mechanical Engineers Posses

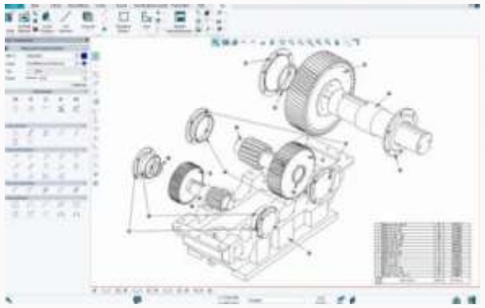


1. Communication

Mechanical engineering is never a solo venture. The profession involves collaborating with other engineers, designers, testers, and leaders at various stages of the product development cycle to create an effective end result and meet all the necessary requirements.

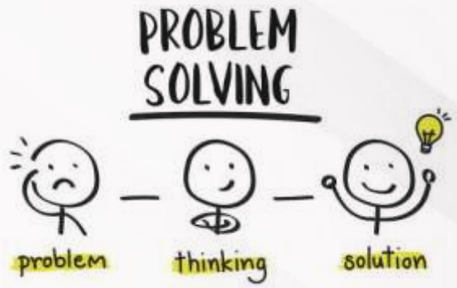
2. Computer design

Since they frequently work with CAD programs, mechanical engineers need computer design skills. They typically use CAD (computer-aided design) software to imagine and construct mechanical products and systems, which forms a key part of the initial product development process.



3. Problem solving

Mechanical engineers must also possess strong problem-solving skills. They typically use these abilities alongside a keen eye for detail to identify and fix issues in their projects. This could involve finding a more robust material to strengthen an exterior covering, for instance, or restructuring the wiring of a device to ensure complete functionality.

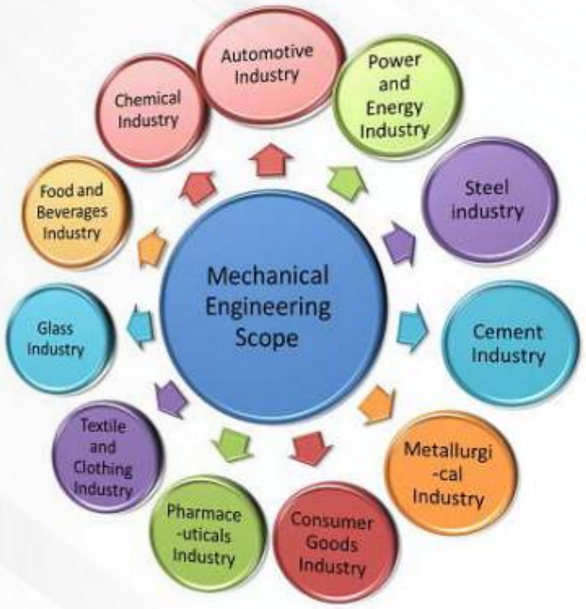


4. Creativity

Mechanical engineers are involved in designing products and mechanical systems that utilize modern software and components. Since technology constantly evolves, mechanical engineers must be creative to adapt to new concepts.

Areas of Mechanical Engineering Expertise

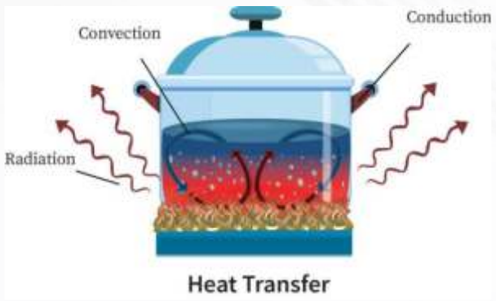
Mechanical engineering offers a diverse range of career opportunities and specializations, allowing professionals to work on various projects related to



Overview of the various sub-disciplines within Mechanical engineering, highlighting the diverse areas in which Mechanical engineers can specialize. Each segment of the circle represents a different specialty:

1. Thermodynamics and Heat Transfer

- Thermodynamics: Study of energy, heat, and work.
- Heat Transfer: Mechanisms of heat exchange (conduction, convection, radiation).

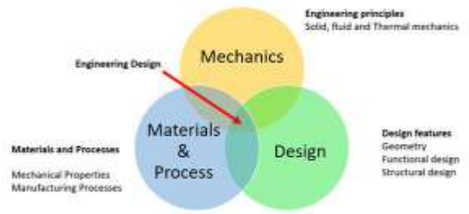


2. Fluid Mechanics

- Fluid Dynamics: Behavior of fluids in motion.
- Hydraulics: Use of fluids to transmit power.
- Aerodynamics: Study of air and other gases in motion.

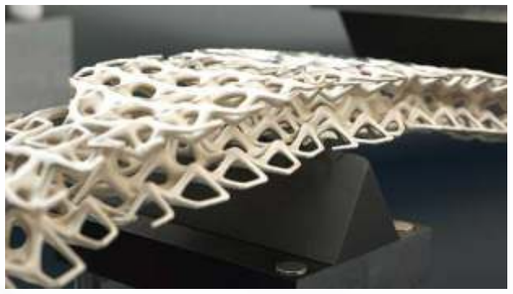
3. Materials Science and Engineering

- Material Properties: Study of the physical and chemical properties of materials.
- Metallurgy: Science of metals and their properties.
- Composite Materials: Development and analysis of materials made from two or more constituent materials.



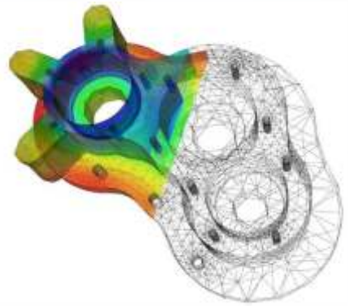
4. Solid Mechanics

- Stress and Strain Analysis: Study of forces and deformation in solid materials.
- Vibrations: Analysis of oscillatory systems.
- Fracture Mechanics: Study of the propagation of cracks in materials.



5. Mechanical Design and CAD (Computer-Aided Design)

- Product Design: Creating new mechanical components and systems.
- CAD Software: Using software to design and simulate mechanical parts.
- Finite Element Analysis (FEA): Numerical method for predicting how a part or assembly behaves under given conditions.



6. Manufacturing Engineering

- Manufacturing Processes: Techniques for producing mechanical parts (casting, machining, forming, etc.).
- Additive Manufacturing: 3D printing and other layer-by-layer manufacturing techniques.
- Quality Control: Ensuring products meet specified standards.

7. Control Systems

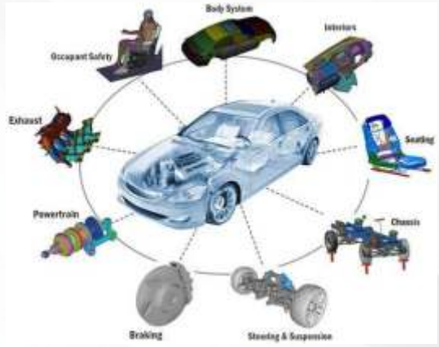
- Automation: Use of control systems to operate equipment with minimal human intervention.
- Robotics: Design and application of robots.
- Mechatronics: Integration of mechanical, electronic, and computer systems.

8. Energy Systems

- Power Generation: Design and analysis of systems that generate energy (e.g., turbines, engines).
- Renewable Energy: Study and application of energy from renewable sources (solar, wind, geothermal).
- HVAC (Heating, Ventilation, and Air Conditioning): Design of systems for climate control in buildings and vehicles.

9. Automotive Engineering

- Vehicle Dynamics: Study of forces and motion in vehicles.
- Engine Design: Design and analysis of internal combustion engines and electric motors.
- Transportation Systems: Analysis and optimization of transportation networks.



10. Biomechanical Engineering

- Prosthetics and Orthotics: Design of artificial limbs and supportive devices.
- Biomechanics: Study of the mechanics of biological systems.
- Medical Devices: Design and analysis of equipment used in medical applications.

COURSE MENU

I SEMESTER

Course Code	Course Name	Subject Area	Category
INDUCTION PROGRAM	**TWO WEEKS MANDATORY AUDIT COURSE**		
THEORY			
AHSD01	Professional Communication	HSMC	Foundation
AHSD02	Matrices and Calculus	BSC	Foundation
AEED01	Elements of Electrical and Electronics Engineering	ESC	Foundation
ACSD01	Object Oriented Programming	ESC	Foundation
PRACTICAL			
AHSD04	Professional Communication Laboratory	HSMC	Foundation
AEED03	Electrical and Electronics Engineering	ESC	Foundation
ACSD02	Object Oriented Programming with Java	ESC	Foundation
AMED01	Engineering Workshop	ESC	Foundation
EXPERIENTIAL ENGINEERING EDUCATION (ExEED)			
ACSD03	Essentials of Innovation	Skill	Skill
MANDATORY COURSE			
AHSD06	Environmental Science	MC	MC – I

II SEMESTER

Course Code	Course Name	Subject Area	Category
THEORY			
AHSD03	Engineering Chemistry	BSC	Foundation
AHSD07	Applied Physics	BSC	Foundation
AHSD08	Differential Equations and Vector Calculus	ESC	Foundation
AMED04	Engineering Mechanics	ESC	Foundation
PRACTICAL			
AHSD05	Engineering Chemistry Laboratory	BSC	Foundation
AHSD09	Applied Physics Laboratory	BSC	Foundation
AMED05	Computer Aided Engineering Drawing	ESC	Foundation
ACSD06	Programming for Problem Solving Laboratory	ESC	Foundation
EXPERIENTIAL ENGINEERING EDUCATION (ExEED)			
ACSD07	Mobile and Web Applications Development	Skill	Skill
MANDATORY COURSE			
AHSD10	Gender Sensitization	MC	MC – I
FIELD PROJECT			

III SEMESTER

Course Code	Course Name	Subject Area	Category
THEORY			
AHSD11	Probability and Statistics	BSC	Foundation
AMED06	Solid Mechanics and Materials	PCC	Core
AMED07	Engineering Thermodynamics	PCC	Core
AMED08	Manufacturing Processes	PCC	Core
ACSD08	Data Structures	ESC	Foundation
PRACTICAL			
AMED09	Solid Mechanics and Materials Laboratory	PCC	Core
AMED10	Manufacturing Processes Laboratory	PCC	Core
ACSD11	Data Structures Laboratory	ESC	Foundation
EXPERIENTIAL ENGINEERING EDUCATION (ExEED)			
ACSD12	Prototype / Model Development	Skill	Skill
VALUE ADDED COURSE			

IV SEMESTER

Course Code	Course Name	Subject Area	Category
THEORY			
AMED11	Design of Machine Elements	PCC	Core
AMED12	Theory of Mechanisms and Machines	PCC	Core
AMED13	Thermal Engineering Systems	PCC	Core
AMED14	Fluid Mechanics	PCC	Core
AMED15	Machining Processes and Metrology	PCC	Core
PRACTICAL			
AMED16	Thermal and Fluids Engineering Laboratory	PCC	Core
AMED17	Machine Drawing Laboratory	PCC	Core
AMED18	Machining Processes and Metrology Laboratory	PCC	Core
SKILL ENHANCEMENT PROJECTS			
ACSD18	DevOps Engineer#	Skill	Skill
VALUE ADDED COURSE			
INTERNSHIP			

#The course would consist of talks by working professionals from industry, government, academia & research organizations.

V SEMESTER

Course Code	Course Name	Subject Area	Category
THEORY			
AMED19	Finite Element Analysis	PCC	Core
AMED20	Machine Design	PCC	Core
AMED21	Artificial Intelligence in Mechanical Engineering	PCC	Core
AMED22	Computer Aided Engineering	PCC	Core
	Program Elective – I	PEC	Elective
PRACTICAL			
AMED28	Dynamics and Vibrations Laboratory	PCC	Core
AMED29	Computer Aided Engineering Laboratory	PCC	Core
SKILL ENHANCEMENT PROJECTS			
	Skill #	Skill	Skill
	Engineering Design Project	Skill	Skill
VALUE ADDED COURSE			

#The course would consist of talks by working professionals from industry, government, academia & research organizations.

VI SEMESTER

Course Code	Course Name	Subject Area	Category
THEORY			
AMED30	Heat Transfer	PCC	Core
AMED31	Computational Fluid Dynamics for Mechanical Engineering Applications	PCC	Core
	Program Elective – II	PCC	Core
	Program Elective – III	PEC	Elective
	Open Elective – I	OEC	Elective
PRACTICAL			
AMED44	Heat Transfer Laboratory	PCC	Core
AMED45	Computational Fluid Dynamics Laboratory	PCC	Core
SKILENHANCEMENT PROJECTS			
	Skill #	Skill	Skill
	Development Project	Skill	Skill
VALUE ADDED COURSE			
INTERNSHIP			

VII SEMESTER

Course Code	Course Name	Subject Area	Category
THEORY			
AMED46	Energy Systems	PCC	Core
AMED47	Measurements and Instrumentation	PCC	Core
	Program Elective – IV	PEC	Elective
	Program Elective – V	PEC	Elective
	Open Elective – II	OEC	Elective
PRACTICAL			
AMED60	Measurements and Instrumentation Laboratory	PCC	Core
AMED61	Additive Manufacturing for 3D Printing Laboratory	PCC	Core
PROJECT WORK			
AMED62	Project Work (Phase - I)	PROJ	Project
MANDATORY COURSE			
AHSD14	Essence of Indian Traditional Knowledge	MC	MC-II

VIII SEMESTER

Course Code	Course Name	Subject Area	Category
THEORY			
AHSD15	Managerial Economics and Financial Analysis	HSMC	Foundation
	Program Elective – VI	PEC	Elective
	Open Elective-III	OEC	Elective
PRACTICAL			
AMED70	Project Work (Phase - II)	PCC	Project

ELECTIVE **COURSES**

PROGRAM ELECTIVES COURSES (PEC)

The below listed courses are Professional electives and the student has to study six courses as professional electives.

Course Cod	Name of the Course	Prerequisites	Preferred Semester	Credits
AMED23	Electric and Hybrid Vehicles	Engineering Thermodynamics	V	3
AMED24	Additive Manufacturing Technology	Manufacturing Processes	V	3
AMED25	Composite Materials	Materials and Mechanics of Solids	V	3
AMED26	Product Design and Process	Manufacturing Processes	V	3
AMED27	Micro and Nano Manufacturing	Manufacturing Processes	V	3
AMED32	Nano Technology	Machining Processes and Metrology	VI	3
AMED33	Tribology	Fluid Mechanics	VI	3
AMED34	Renewable Energy Sources	Fluid Mechanics	VI	3
AMED35	Computational Fluid Flows	Ordinary Differential Equations and Numerical Methods, Fluid Mechanics	VI	3
AMED36	Total Quality Management	Machining Processes and Metrology	VI	3
AMED37	Mechanical Vibrations	Theory of Machines	VI	3
AMED38	Unconventional Machining Process	Manufacturing Processes	VI	3
AMED39	MEMS and Microsystem Technology	Machining Processes and Metrology	VI	3
AMED40	Materials Selection for Product Development	Materials and Mechanics of Solids	VI	3
AMED41	Smart Materials	Materials and Mechanics of Solids	VI	3
AMED48	Mechatronics Systems	Computer Aided Engineering	VII	3
AMED49	Robotics Engineering	Computer Aided Engineering	VII	3
AMED50	Operations Research	Differentail Equations and Vector Calculus	VII	3
AMED51	Power Plant Engineering	Engineering Thermodynamics	VII	3
AMED52	Gas Turbines and Jet Propulsion Systems	Applied Thermodynamics	VII	3
AMED53	Design for Manufacturing and Assembly	Design of Machine Elements	VII	3
AMED54	Plant Layout and Material Handling	Machining Processes and Metrology	VII	3
AMED55	Traditional Fossil Fuels	Machining Processes and Metrology	VII	3
AMED56	Experimental Stress Analysis	Theory of Machines	VII	3
AMED57	Corrosion Science & Engineering	Materials and Mechanics of Solids	VII	3
AMED63	Tool Design	Machining Processes and Metrology	VIII	3
AMED64	Production Planning and Control	Machining Processes and Metrology	VIII	3
AMED65	Automation in Manufacturing	Computer Aided Engineering	VIII	3
AMED66	Gas Dynamics	Engineering Thermodynamics	VIII	3
AMED67	Supply Chain Management	Plant Layout and Material Handling	VIII	3

OPEN ELECTIVE COURSES (OE

The courses listed below are offered by the Department of **Mechanical Engineering** for students of other departments.

Course Code	Course Name	Prerequisites	Credits
AMED42	Introduction to Finite Element Method	-	3
AMED43	Elements of Automobile Engineering	-	3
AMED58	Introduction to Robotics	-	3
AMED59	Basics of Refrigeration and Airconditioning	-	3
AMED68	Elements of Mechanical Engineering	-	3
AMED69	Waste to Energy Conversion Techniques	-	3

Professional Development for Skill Enhancement and Certification Programs

S.No	Name of the Course	Certification Agency
1	CATIA Certification	Dassualt Systems.Inc (France)
2	Solid Works Certification	Dassualt Systems.Inc (France)
3	ANSYS Certification (Professional)	Dassualt Systems.Inc (France)
4	Autodesk- AUTOCAD, Revit, Fusion 360, Inventor	Autodesk.Inc (USA)
5	CNC Part Programming (Lathe Certification)	Fanuc India Ltd/ATI
6	CNC Part Programming (CNC Milling Certification)	Fanuc India Ltd/ATI
7	Hyper mesh Certification	Hyperworks India
8	Mat lab Simulation Certification	Mathworks India
9	Non-Destructive Testing Certification	M/S Jyothi Laboratories

COURSE **SYNOPSIS**

CORE **COURSES**

Matrices and Calculus

This course Matrices and Calculus is a foundation course of mathematics for all engineering branches. The concepts of Matrices, Eigen Values, Eigen Vectors, Functions of Single and Several Variables, Fourier Series and Multiple Integrals. This course is applicable for simulations, colour imaging process, finding optimal solutions in all fields of industries.

Elements of Electrical and Electronics Engineering

This course enables knowledge on electrical quantities such as current, voltage, and power, energy to know the impact of technology in global and societal context. It provides the knowledge on basic DC and AC circuits used in electrical and electronic devices, highlights the importance of electrical machines and basics of semiconductor devices like diodes and transistors.

Object Oriented Programming

This course presents the concepts of object orientation and object-oriented programming techniques using Java programming language. It provides students with a thorough look at the basic constructs of the Java programming language such as its basic data types and operations. It also emphasizes on the use of standard Java APIs that allow students to develop text-based and GUI applications. It will also provide the programming techniques on exception handling and input/output files. At the end of this course, students should be able to use the basic constructs in object-oriented programming and utilize the selected Java APIs.

Differential Equations and Vector Calculus

This course serves as a foundation course on differential equations and vector calculus. It includes techniques for solving ordinary differential equations, partial differential equations, vector differentiation and vector integration. It is designed to extract the mathematical developments, skills, from basic concepts to advance level of engineering problems to meet the technological challenges.

Engineering Mechanics

Engineering Mechanics is a foundational course that introduces students to the principles of mechanics and their applications in analyzing and solving real-world engineering problems. This course focuses on imparting a comprehensive understanding of statics and dynamics, which are essential concepts for engineers across various disciplines. Through a combination of theoretical concepts, mathematical derivations, and practical applications, students will develop the skills necessary to analyze and predict the behavior of structures and systems under different conditions.

Probability and Statistics

Probability theory is the branch of mathematics that deals with modelling uncertainty. The course includes: Baye's theorem, random variables, probability distributions, hypothesis testing, confidence interval and linear regression. The use of probability models and statistical methods is for analyzing data, designing, manufacturing a product and the observed class frequencies for engineering and sciences.

Solid Mechanics and Materials

Mechanics of Solids provide students an understanding of deformation of rigid bodies under static loading conditions. It covers the concepts of engineering mechanics of materials and the behavior of the materials and components under applied loads. The purpose of the course is application of strength of materials concepts with respect to mechanical engineering design and analysis

Engineering Thermodynamics

Thermodynamics is the science that deals with the relationship between heat and work and those properties of systems that bear relation to heat and work. General laws of energy transformations concerning all types of systems, mechanical, electrical and chemical may fall within the purview of this science. It is a science based on a number of empirical laws formed by experimentation from which all predictions concerning the physical behavior of the system may be deduced by logical reasoning. The findings have been formalized into the various laws of thermodynamics. The power cycles and refrigeration cycle based on thermodynamic system is studied. The students are familiarizing with standard charts and tables

Manufacturing Processes

This course is to introduce the concept of manufacturing process with the help of various processes widely employed in the industries. This course consists of casting, welding, sheet metal forming, extrusion and forging processes with the related details of equipment and applications. It Introduces the different manufacturing processes and breakeven analysis.

Data Structures

The course covers some of the general-purpose data structures and algorithms, and software development. Topics covered include managing complexity, analysis, static data structures, dynamic data structures and hashing mechanisms. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter in real life. This course reaches to student by power point presentations, lecture notes, and lab which involve the problem solving in mathematical and engineering areas.

Design of Machine Elements

Machine design emphasizes for influence the failsafe design in the mechanical systems using different theories of failure modes. The design of machine members focuses mainly on design of machine elements subjected to various types of loads and components include joints; Riveted, Welded, threaded joints, shafts and springs using design standards, B.I.S codes of steels. The Design philosophy is based on strength, stiffness and material selection for manufacture of machine elements.

Theory of Mechanisms and Machines

Mechanical devices are designed to have mobility to perform certain functions. The theory behind the study of Kinematics of Machine emphasizes to design machines by understanding the relationship between the geometry and the motion of various parts of machine. This course will provide the knowledge on how to analyze the motions and design synthesis of mechanisms to give required mobility. This includes relative motion analysis of gears by adopting analytical approaches to estimate displacement, velocity, and acceleration of links in a machine. This course is useful for balancing the four wheelers and Two wheelers to avoid skidding and reduce the vibrational damages.

Thermal Engineering Systems

combustion engines which are widely used in different industrial applications such as automobile, agriculture, industry for transport, water pumping, electricity generation, earth moving and for supply mechanical power. This course also deals with working principles of compressors and refrigeration systems in various fields of engineering.

Fluid Mechanics

Fluid mechanics is that branch of science which deals with the behavior of the fluids (liquids or gases) at rest as well as in motion. Thus, this branch of science deals with the static, kinematics and dynamic aspects of fluids. The proper understanding of mechanics of fluids is critical in various branches of engineering. The primary motive of this course is to examine, through the laws of fluid mechanics and thermodynamics, the means by which the energy transfer is carried out in the turbo-machinery, together with the differing behavior of individual types in operation. A modern discipline, called computational fluid dynamics (CFD), is devoted to this approach to solving fluid mechanics problems.

Machining Processes and Metrology

The core course "Machining Processes and Metrology" is designed to equip individuals with the skills necessary for shaping metal parts using various machines, including lathes, grinders, drill presses, milling machines, and shapers. The course places a strong emphasis on safety, computational aspects related to work dimensions, and the testing of feeds and speeds using precision measuring instruments. Metrology, a key component of the course, holds significant value for students and practitioners in mechanical and allied engineering fields. The course aims to provide knowledge for the development of measurement procedures and the execution of metrological experiments, ensuring a comprehensive understanding of precision manufacturing and quality control.

Finite Element Analysis

Finite Element Analysis (FEA) is a powerful computational tool used in engineering to simulate and analyze the behavior of structures and systems under various loading conditions. This course provides a comprehensive overview of FEA, covering its principles, applications, and practical implementation techniques. Participants will gain hands-on experience in using FEA software to solve engineering problems and interpret analysis results.

Machine Design

Machine design is a fundamental aspect of mechanical engineering that involves the conceptualization, analysis, and synthesis of mechanical systems and components to fulfill specific functions. This course provides a comprehensive overview of machine design principles, methodologies, and practices, covering topics ranging from design calculations and material selection to manufacturing considerations and optimization techniques.

Artificial Intelligence in Mechanical Engineering

Artificial Intelligence (AI) has become an integral part of modern mechanical engineering, revolutionizing traditional practices and enabling innovative solutions to complex engineering problems. This course provides an in-depth exploration of the applications, techniques, and implications of AI in mechanical engineering, empowering participants to leverage AI technologies to enhance design, analysis, manufacturing, and maintenance processes.

Computer Aided Engineering

Computer-Aided Engineering (CAE) plays a pivotal role in modern engineering by leveraging computational tools and techniques to analyze, simulate, and optimize engineering designs. This course provides a comprehensive overview of CAE methodologies, software tools, and applications across various engineering disciplines, empowering participants to enhance their engineering skills and proficiency in utilizing CAE for solving complex engineering problems.

Heat Transfer

Heat transfer is a fundamental concept in engineering and plays a crucial role in various industrial processes, energy systems, and everyday applications. This course provides a comprehensive overview of heat transfer principles, mechanisms, and applications, equipping participants with the knowledge and skills necessary to analyze and solve heat transfer problems in practical engineering scenarios.

Computational Fluid Dynamics for Mechanical Engineering Applications

Computational Fluid Dynamics (CFD) has become an essential tool in mechanical engineering for analyzing fluid flow phenomena and optimizing the design of various engineering systems. This course offers a comprehensive exploration of CFD principles, methodologies, and applications tailored specifically for mechanical engineering contexts. Participants will gain hands-on experience in using CFD software to solve fluid flow problems encountered in diverse mechanical engineering applications.

Energy Systems

Energy systems play a critical role in modern society, encompassing the generation, conversion, distribution, and utilization of energy resources to meet the diverse needs of individuals, industries, and economies. This course provides a comprehensive overview of energy systems, covering various technologies, methodologies, and strategies for sustainable energy production, management, and utilization. Participants will gain insights into the principles, challenges, and opportunities associated with energy systems engineering.

Measurements and Instrumentation

Measurements and instrumentation form the backbone of engineering and scientific endeavors, enabling the acquisition of accurate data for analysis, monitoring, and control purposes. This course provides a comprehensive overview of measurement principles, instrumentation techniques, and data acquisition methods, equipping participants with the knowledge and skills necessary to design, implement, and interpret measurements in diverse engineering applications.

Professional Electives:

Electric and Hybrid Vehicles

Electric and hybrid vehicles (EHVs) represent a transformative shift in the automotive industry towards cleaner, more sustainable transportation solutions. This course provides a comprehensive overview of electric and hybrid vehicle technologies, covering key principles, components, design considerations, and emerging trends. Participants will gain insights into the operation, performance, and challenges of EHVs, as well as the societal and environmental implications of their adoption.

Additive Manufacturing Technology

Additive Manufacturing (AM), also known as 3D printing, has emerged as a revolutionary technology with profound implications for various industries, including aerospace, automotive, healthcare, and consumer goods. This course provides a comprehensive exploration of additive manufacturing principles, processes, materials, applications, and advancements, enabling participants to understand the capabilities and potentials of this transformative manufacturing technique.

Composite Materials

Composite materials have revolutionized various industries by offering unique combinations of properties such as high strength, low weight, corrosion resistance, and design flexibility. This course provides a comprehensive exploration of composite materials, covering their composition, manufacturing processes, properties, applications, and design considerations. Participants will gain insights into the diverse range of composite materials and their significance in engineering and manufacturing.

Product Design and Process

Product design and process engineering are integral components of the product development lifecycle, encompassing the conceptualization, design, manufacturing, and optimization of products. This course offers a comprehensive exploration of product design principles, methodologies, and processes, equipping participants with the knowledge and skills necessary to develop innovative products and streamline manufacturing processes effectively.

Micro and Nano Manufacturing

Micro and Nano Manufacturing (MNM) have emerged as key enablers of advanced technologies across various industries, offering precise fabrication capabilities at miniature scales. This course provides a comprehensive exploration of MNM principles, techniques, applications, and challenges, equipping participants with the knowledge and skills necessary to design, develop, and optimize micro and nano-scale devices and systems.

Nano Technology

Nanotechnology, the manipulation of matter at the nanoscale, holds immense potential to revolutionize science, engineering, and technology across diverse fields. This course provides a comprehensive exploration of nanotechnology principles, applications, fabrication techniques, and societal implications, offering participants a deep understanding of this transformative field and its multifaceted impacts.

Tribology

Tribology, the science and engineering of interacting surfaces in relative motion, plays a critical role in numerous industries, including automotive, aerospace, manufacturing, and biomedical engineering. This course provides a comprehensive exploration of tribology principles, friction, wear, lubrication, and surface engineering, offering participants a deep understanding of the mechanisms governing surface interactions and strategies for mitigating friction and wear.

Renewable Energy Sources

Renewable energy sources play a pivotal role in the transition towards sustainable and low-carbon energy systems, offering clean, abundant, and environmentally friendly alternatives to fossil fuels. This course provides a comprehensive exploration of renewable energy technologies, including solar, wind, hydroelectric, biomass, geothermal, and tidal energy, as well as their integration, economics, and environmental implications.

Computational Fluid Flows

Computational Fluid Dynamics (CFD) has become an indispensable tool for engineers and researchers in simulating and analyzing fluid flows in various applications, including aerospace, automotive, energy systems, and environmental engineering. This course provides a comprehensive exploration of CFD principles, numerical methods, simulation techniques, and applications, enabling participants to understand and utilize CFD effectively in engineering design and analysis.

Total Quality Management

Total Quality Management (TQM) is a comprehensive approach to improving the quality and performance of products, services, and processes within an organization. This course offers an in-depth exploration of TQM principles, methodologies, tools, and applications, enabling participants to develop the knowledge and skills necessary to drive continuous improvement and excellence in organizational performance.

Mechanical Vibrations

Mechanical vibrations play a crucial role in various engineering systems, including machinery, structures, vehicles, and aerospace components. This course provides a comprehensive understanding of mechanical vibrations, covering fundamental principles, analysis techniques, and practical applications. Participants will learn how to analyze, model, and mitigate vibrations in engineering systems, ensuring their safety, reliability, and performance.

Unconventional Machining Process

Unconventional machining processes play a critical role in modern manufacturing, offering alternative methods for shaping, cutting, and finishing materials that are difficult to machine using conventional techniques. This course provides a comprehensive overview of unconventional machining processes, including principles, methodologies, applications, and advancements, enabling participants to understand and utilize these techniques effectively in various manufacturing industries.

MEMS and Microsystem Technology

Micro-Electro-Mechanical Systems (MEMS) and Microsystems technology have revolutionized various fields by enabling the miniaturization of mechanical and electrical components on a microscale. This course provides a comprehensive understanding of MEMS and Microsystems technology, covering fundamental principles, fabrication techniques, device design, and applications, empowering participants to explore and innovate in this rapidly evolving field.

Materials Selection for Product Development

Materials selection is a critical aspect of product development, influencing the performance, cost, and sustainability of manufactured goods. This course provides a comprehensive exploration of materials selection principles, methodologies, and tools, empowering participants to make informed decisions in choosing materials for engineering applications.

Smart Materials

Smart materials are revolutionizing various industries by offering unique properties that can respond to external stimuli, such as temperature, stress, electric fields, and magnetic fields. This course provides an in-depth exploration of smart materials, covering their principles, characteristics, fabrication methods, applications, and advancements, empowering participants to leverage these materials for innovative engineering solutions.

Mechatronics Systems

Mechatronics systems integrate mechanical, electrical, and computer engineering disciplines to design, develop, and control advanced systems with enhanced functionality and intelligence. This course provides a comprehensive understanding of mechatronics principles, methodologies, components, and applications, enabling participants to design and implement innovative mechatronic systems for various engineering domains.

Robotics Engineering

Robotics engineering combines principles from various disciplines, including mechanical engineering, electrical engineering, computer science, and control systems, to design, build, and control robotic systems. This course offers a comprehensive exploration of robotics engineering, covering fundamental concepts, components, algorithms, and applications, empowering participants to design and develop advanced robotic systems for diverse industries and applications.

Operations Research

Operations Research (OR) is a discipline that applies advanced analytical methods to help make better decisions in complex scenarios. This course provides a comprehensive overview of OR techniques, methodologies, and applications, equipping participants with the skills to model, analyze, and optimize various operational problems in business, engineering, and other domains.

Power Plant Engineering

Power plant engineering is a multidisciplinary field that focuses on the design, operation, and maintenance of power generation facilities. This course provides a comprehensive understanding of power plant systems, technologies, and operations, covering thermal, nuclear, renewable, and hybrid power generation methods, as well as environmental considerations and energy efficiency.

Gas Turbines and Jet Propulsion Systems

Gas turbines and jet propulsion systems are integral components of modern aerospace and power generation industries. This course provides an in-depth exploration of the principles, design, operation, and applications of gas turbines and jet propulsion systems, covering both aircraft propulsion and stationary power generation applications.

Design for Manufacturing and Assembly

Design for Manufacturing and Assembly (DFMA) is a methodology focused on optimizing product designs for efficient manufacturing and assembly processes. This course provides a comprehensive understanding of DFMA principles, techniques, and tools, empowering participants to create designs that are cost-effective, reliable, and easy to manufacture and assemble.

Plant Layout and Material Handling

Plant layout and material handling play crucial roles in optimizing the efficiency, productivity, and safety of manufacturing and industrial facilities. This course offers a comprehensive study of plant layout principles, methodologies, and material handling techniques, enabling participants to design and manage efficient and ergonomic production environments.

Traditional Fossil Fuels

Traditional fossil fuels, including coal, oil, and natural gas, have historically been the primary sources of energy for various industries and sectors worldwide. This course provides an in-depth understanding of traditional fossil fuels, covering their exploration, extraction, processing, utilization, environmental impact, and future outlook. Participants will gain insights into the technological advancements, economic implications, and sustainability challenges associated with traditional fossil fuel energy systems.

Experimental Stress Analysis

Experimental stress analysis is a discipline that focuses on the measurement and analysis of stresses and strains in materials and structures through physical testing and instrumentation techniques. This course provides a comprehensive understanding of experimental stress analysis methods, including principles, instrumentation, data acquisition, and interpretation, enabling participants to assess the structural integrity and performance of engineering components and systems.

Corrosion Science & Engineering

Corrosion is a natural process that deteriorates materials, causing damage and failure in various engineering structures and systems. Corrosion science and engineering aim to understand the mechanisms, prevention, and mitigation techniques of corrosion in order to ensure the durability and reliability of materials and components. This course provides a comprehensive overview of corrosion science and engineering, covering fundamental principles, types of corrosion, corrosion prevention strategies, and advanced mitigation techniques.

Tool Design

Tool design is a critical aspect of manufacturing engineering, focusing on the creation of tools and fixtures required for the production of components and products. This course provides a comprehensive overview of tool design principles, techniques, and methodologies, covering various aspects such as tool selection, design considerations, manufacturing processes, and quality control. Participants will gain practical knowledge and skills essential for designing efficient and cost-effective tools to meet production requirements.

Production Planning and Control

Production planning and control (PPC) is a vital function in manufacturing and service industries, responsible for ensuring efficient utilization of resources, timely delivery of products/services, and meeting customer demands. This course provides a comprehensive understanding of production planning and control principles, techniques, and strategies, covering various aspects such as demand forecasting, capacity planning, scheduling, inventory management, and quality control. Participants will learn how to design and implement effective production planning and control systems to optimize production processes and enhance organizational performance.

Automation in Manufacturing

Automation has become a cornerstone in modern manufacturing, revolutionizing production processes, improving efficiency, and driving innovation. This course offers a comprehensive understanding of automation in manufacturing, covering principles, technologies, applications, and implementation strategies. Participants will explore the various facets of automation, including robotics, programmable logic controllers (PLCs), computer numerical control (CNC) systems, sensors, and industrial communication networks, and learn how to design, integrate, and optimize automated manufacturing systems.

Gas Dynamics

Gas dynamics is a branch of fluid mechanics that focuses on the study of compressible flows, including the behavior of gases under different thermodynamic conditions. This course provides a comprehensive understanding of gas dynamics principles, equations, and applications in various engineering fields, such as aerospace, mechanical, and chemical engineering. Participants will explore the fundamentals of gas flow, shock waves, expansion processes, and propulsion systems, and learn how to analyze and design systems involving compressible fluid flows.

Supply Chain Management

Supply Chain Management (SCM) plays a critical role in modern business operations, encompassing the planning, procurement, production, distribution, and logistics processes involved in delivering products and services to customers. This course offers a comprehensive understanding of supply chain management principles, strategies, and practices, covering topics such as demand forecasting, inventory management, supplier relationships, logistics optimization, and sustainability. Participants will learn how to design, analyze, and optimize supply chains to improve efficiency, reduce costs, and enhance customer satisfaction.

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