**PREFACE**

The Department of Mechanical Engineering was founded in 1963 when Sindh University Engineering College was established. The college was upgraded to Mehran University of Engineering and Technology in 1977. A four year undergraduate programme of Mechanical Engineering is being offered, leading to the degree of Bachelor of Engineering.

The Department has gained a good reputation in the while designing its courses and syllabi keeping in view the trend and requirement of the field. The syllabus is revised and updated from time to time, wherein the recommendations of National Curriculum Revision Committee (NCRC) are also well taken into consideration.

Maintaining this trend, the Department of Mechanical Engineering has implemented the conversion from term system to Semester system and revised its syllabus entirely, with the inclusion of a few new courses including Thermal Power Plants and Safety, Health & Environment. State of arts laboratories, e.g. Automobile, Aerodynamics, Engineering Mechanics, Energy systems, Fluid Mechanics, Mechatronics and Mechanical Vibrations have also been established within the department. Mechanical Engineering Workshop has also been equipped with the advanced and innovative machines to be employed for grooming the students in areas of design and Manufacturing. The revised syllabus has been approved by Board of Studies, Board of Faculty and Academic Council in 2012-2013.

The undersigned would like to express gratitude to all the faculty members in general and senior faculty members in particular for their valuable co-operation and suggestions in preparing this revised syllabus.

December, 2012

**Prof. Dr. Hassan Ali Khan Durrani**

**Chairman**

**Department of Mechanical Engineering**

**INTRODUCTION**

This prospectus is intended to provide you an introduction to undergraduate and post graduate study at the Department of Mechanical Engineering and to help you decide whether this department provides what you are seeking in terms of both your academic and personal aspiration.

Sindh University Engineering College, established in 1963 and later upgraded to Mehran University of Engineering and Technology in 1977, is today one of the Pakistan’s leading public universities. It owes to its origin to three major departments, the one of which is Mechanical Engineering Department. Our full-time student population of the department is almost 525 at undergraduate level and over 40 students are post graduate.

In 1975, the Department of Mechanical Engineering started a four years degree course in Industrial Engineering. First batch of Industrial Engineering graduated in 1979-80. Presently it is a separate department.

With 23 academic staff, including 5 professors, and more than 18 academic related and technical support staff, the department possesses excellent computational and experimental facilities. Numerous personal computers are available, together with access to several mainframe machines. A number of experimental facilities are also available, including a large scale Mechanical Engineering Workshop. Other laboratory facilities cover all the main areas of Mechanical Engineering.

The Department offers two Postgraduate programs in the fields of Manufacturing Engineering and Energy Systems Engineering. The former was started in 1977 and is being conducted by highly qualified and experienced faculty of the Department under the Directorate of Postgraduate studies. The later has been started from the year 2010. These taught courses lead to one of three qualifications: Certificate, Diploma or Masters. Part of the taught programme is made up of course work. The remainder involves independent study for a supervised dissertation or project on a topic and to be submitted by a particular date. Both elements are examined.

Postgraduate study at the Department can also be undertaken in the form of research. The principal research degrees are Master of Philosophy (M.Phill) and Doctor of Philosophy (PhD). Research degrees involve independent study, assisted by a supervisor and co- supervisor, leading to the completation of thesis.

**1. Mechanical Engineering Vision Statement**

The Mechanical Engineering Department’s vision is to acquire recognition for high valued curriculum designed for the customers seeking admission in prestigious alma meter, Mehran University of Engineering and Technology.

**2. Mechanical Engineering Mission Statement**

Consistent with the University’s Mission, learning is the first priority in the Mechanical Engineering Department. To implement our mission, we ensure the dissemination of innovative teaching and professional skills. The Department is committed to facilitate the outstanding education to undergraduate and postgraduate students to cater the techno-scientific needs of society.

**3. Career Opportunities**

Mechanical Engineering has diverse applications in the realm of science and technology. The graduates of Mechanical Engineering have opportunities in many public as well as private sector industries. With the rapid growth rate of expansion in the industrial sector, the employment potential for mechanical engineers has been increased manifold.

These engineers are employed in a number of companies, organization, and industries, e.g. automobile, manufacturing process plants, renewable energy technologies, automation technology, oil refineries, technical wings of armed forces, marine engineering departments, space research organization, electronics, etc. The department equips the young students with a state of art, innovative technical knowledge. These professionals with rich managerial and technical education could find job opportunities in administrative and managerial positions in public as well as private sector industries.

They can offer their expertise in teaching and innovative research institutes. In addition, these high valued human resources can be profoundly progressive in sales, marketing, and consultancy pursuits. Several government departments including telecommunication defence, and PWD, etc, employ mechanical engineers to cater their technical needs.

**4. Educational Objectives**

* To prepare students for successful careers and lifelong learning.
* To train students in methods of analysis including the mathematical and computational skills for solving real world problems.
* To develop skills pertinent to the design process, including the student’s ability to formulate problems, to think creatively to communicate effectively, to synthesize information applications.
* To teach students to use current experimental and data analysis techniques.
* To instill in the students an understanding of their professional, social and ethical responsibilities.
* To strengthen the link between department and industry.
* To enhance the quality of Mechanical Engineering program through systematic assessments and feedback.
* To inculcate emerging fields into the curriculum.

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEEERING**

**(SYLLABUS (FROM 13-BATCH ON WARDS)**

**First Semester**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. #.** | **Course**  **Codes** | **Name of Subjects** | **Credit**  **Hours** | | **Marks** | | |
| **Th** | **Pr** | **Theory** | **Practical** | **Total** |
| 1 | (SS III) | Islamic Studies / Ethics | 02 + 00 | | 50 | 00 | 50 |
| 2 | (PS 106) | Pakistan Studies | 02 + 00 | | 50 | 00 | 50 |
| 3 | (MTH 102) | Applied Calculus | 03 + 00 | | 100 | 00 | 100 |
| 4 | (ME 101) | Engineering Drawing & Graphics | 02 + 02 | | 50 | 100 | 150 |
| 5 | (ME 111) | Engineering Statics | 03 + 01 | | 100 | 50 | 150 |
| 6 | (ME 121) | Engineering Materials | 03 + 00 | | 100 | 00 | 100 |
| **Total** | | | **18** | | **450** | **150** | **600** |

**Second Semester**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. #.** | **Course**  **Codes** | **Name of Subjects** | **Credit**  **Hours** | | **Marks** | | |
| **Th** | **pr** | **Theory** | **Practical** | **Total** |
| 1 | (EN 101) | Functional English | 03 + 00 | | 100 | 00 | 100 |
| 2 | (MTH 113) | Linear Algebra, Differential Equations and Analytical Geometry | 03 + 00 | | 100 | 00 | 100 |
| 3 | (ME 131) | Engineering Dynamics | 03 + 00 | | 100 | 00 | 100 |
| 4 | (El 102) | Electrical Technology | 03 + 01 | | 100 | 50 | 150 |
| 5 | (ME 141) | Workshop Practice | 00 + 02 | | 00 | 100 | 100 |
| **Total** | | | **15** | | **400** | **150** | **550** |

**Third Semester**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. #.** | **Course**  **Codes** | **Name of Subjects** | **Credit**  **Hours** | | **Marks** | | |
| **Th** | **pr** | **Theory** | **Practical** | **Total** |
| 1 | (MTH 213) | Complex Variables & Transforms | 03 + 00 | | 100 | 00 | 100 |
| 2 | (ME 201) | Strength of Materials-I | 03 + 01 | | 100 | 50 | 150 |
| 3 | (ME 211) | Mechanics of Machines-I | 02 + 00 | | 50 | 00 | 50 |
| 4 | (ME 221) | Thermodynamics-I | 03 + 01 | | 100 | 50 | 150 |
| 5 | (ES 281) | Basic Electronics | 03 + 01 | | 100 | 50 | 150 |
| **Total** | | | **17** | | **450** | **150** | **600** |

**Fourth Semester**

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| **S. #.** | **Course**  **Codes** | **Name of Subjects** | **Credit**  **Hours** | | **Marks** | | |
| **Th** | **pr** | **Theory** | **Practical** | **Total** |
| 1 | (CS-225) | Introduction to Computers & C++ Programming | 03 + 01 | | 100 | 50 | 150 |
| 2 | (ME 231) | Strength of Materials-II | 03 + 00 | | 100 | 00 | 100 |
| 3 | (ME 241) | Thermodynamics-II | 03 + 01 | | 100 | 50 | 150 |
| 4 | (ME 251) | Fluid Mechanics-I | 03 + 01 | | 100 | 50 | 150 |
| 5 | (ME 261) | Mechanics of Machines-II | 02 + 01 | | 50 | 50 | 100 |
| **Total** | | | **18** | | **450** | **200** | **650** |

**Fifth Semester**

|  |  |  |  |  |  |  |  |
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| **S. #.** | **Course**  **Codes** | **Name of Subjects** | **Credit**  **Hours** | | **Marks** | | |
| **Th** | **pr** | **Theory** | **Practical** | **Total** |
| 1 | (MTH 311) | Numerical Analysis & Computer Applications | 03 + 01 | | 100 | 50 | 150 |
| 2 | (ME 301) | Heat & Mass Transfer | 03 + 01 | | 100 | 50 | 150 |
| 3 | (ME 311) | Applied Aerodynamics | 02 + 01 | | 50 | 50 | 100 |
| 4 | (ME 321) | Fluid Mechanics-II | 03 + 01 | | 100 | 50 | 150 |
| 5 | (ME 331) | Machine Design & CAD-I | 03 + 00 | | 100 | 00 | 100 |
| **Total** | | | **18** | | **450** | **200** | **650** |

**Sixth Semester**

|  |  |  |  |  |  |  |  |
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| **S. #.** | **Course**  **Codes** | **Name of Subjects** | **Credit**  **Hours** | | **Marks** | | |
| **Th** | **pr** | **Theory** | **Practical** | **Total** |
| 1 | (ME 341) | Instrumentation & Control | 02 + 01 | | 50 | 50 | 100 |
| 2 | (MTH 317) | Statistics & Probability | 03 + 00 | | 100 | 00 | 100 |
| 3 | (ME 351) | Machine Design & CAD-II | 03 + 01 | | 100 | 50 | 150 |
| 4 | (ME 371) | Heating, Ventilation and Air Conditioning | 03 + 01 | | 100 | 50 | 150 |
| 5 | (ME 381) | Mechanical Vibrations | 03 + 01 | | 100 | 50 | 150 |
| **Total** | | | **18** | | **450** | **200** | **650** |

**Seventh Semester**

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| **S. #.** | **Course**  **Codes** | **Name of Subjects** | **Credit**  **Hours** | | **Marks** | | |
| **Th** | **pr** | **Theory** | **Practical** | **Total** |
| 1 | (ME 401) | Industrial Economics & Management | 02 + 00 | | 50 | 00 | 50 |
| 2 | (ME 411) | Automobile Engineering | 02 + 01 | | 50 | 50 | 100 |
| 3 | (ME 421) | Mechatronics | 03 + 01 | | 100 | 50 | 150 |
| 4 | (ME 431) | Manufacturing Processes-I | 02 + 01 | | 50 | 50 | 100 |
| 5 | (EE 425) | Safety, Health & Environment | 02 + 00 | | 50 | 00 | 50 |
| 6 | (ME 441) | Thermal Power Plants | 03 + 01 | | 100 | 50 | 150 |
| **Total** | | | **18** | | **400** | **200** | **600** |

**Eightth Semester**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. #.** | **Course**  **Codes** | **Name of Subjects** | **Credit**  **Hours** | | **Marks** | | |
| **Th** | **pr** | **Theory** | **Practical** | **Total** |
| 1 | (ME 451) | Renewable and Emerging Energy Technologies (REET) | 03 + 01 | | 100 | 50 | 150 |
| 2 | (ME 461) | Manufacturing Processes -II | 03 + 01 | | 100 | 50 | 150 |
| 3 | (ME 471) | Maintenance Engineering | 02 + 00 | | 50 | 00 | 50 |
| 4 | (ME 481) | Project Management | 02 + 00 | | 50 | 00 | 50 |
| 5 | (ME 499) | Project/Thesis | -- + -- | | 00 | 200 | 200 |
| **Total** | | | **12** | | **300** | **300** | **600** |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Title of Subject** | **:** | **ENGINEERING DRAWING AND GRAPHICS (ME101)** | | | | | | | |
| **Discipline** | **:** | ME | | First Semester | | | | | |
| **Effective** | **:** | 13 Batch and onwards | | | | | | | |
| **Pre-requisite** | **:** | ……. | | | | | | | |
| **Co-requisite** | **:** | ……. | | | | | | | |
| **Assessment** | **:** | 20 % Sessional Work, 20% Mid Semester Examination, 60 % Written Examination | | | | | | | |
| **Credit Hours** | **:** | 02 | + | | 02 | | | | |
| **Minimum Contact Hours** | **:** | 28 | + | | 84 | **Total Marks:** | 50 | + | 100 |

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| **Aims** | **:** | To produce well-trained engineers having sound understanding of the “Language of Graphics”. The course aims to develop the essential skills of instrumental as well as computer-aided drafting (CAD). |
| **Objectives** | **:** | After successfully completing this course, students would be able to make correct graphical representation of ideas, designs, engineering structures and data relationship. The course enables students to attain following four main objectives in drafting,Accuracy, Speed, Legibility, Neatness |

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| **Contents** | **:** | **Introduction & Basics**: Introduction to graphic language  Essential drawing instruments and their correct use. Line types and lettering. Basic drafting techniques and standards. Curves used in engineering.  **Orthographic Projections:**  Orthographic multiview projection of some simple and composite solids.  **Sections:**  Sectioning and projection of auxiliary views.  **Surface Development:**  Surface development of simple solids such as cylinder, cone, prism and pyramid, surface development of intersecting solids.  **Isometric Projections:**  Isometric projection/drawings of piping.  **Freehand/Sketching**  Sketching and basic rules of sketching.  **Detail, assembly and Working Drawings:**  Preparing detail, assembly and working drawings of various machine and engine parts such as, keys, cotters, foundation bolts, screws, pulleys, couplings, bearings riveted joints and nut and bolts. Fundamentals of geometric dimensioning and tolerancing.  **Computer Aided Drawing:**  Computer aided drafting (CAD). Auto CAD Software |

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| **Recommended Books:** | | | | | |
|  | | 1. | | Mitchells & Spencer, “Technical Drawing”, latest edition. | |
|  | | 2. | | Warren J. Luzzader. ”Fundamentals of Engineering Drawing”, latest edition. | |
|  | | 3. | | James H. Earle, “Engineering Design & Graphics”, latest edition. | |
|  | | 4. | | Paul Ross Wallach, “Fundamentals of modern drafting”, latest edition. | |
|  | | 5. | | User manual of the relevant CAD software. | |
| **Approval:** | | | | | |
|  |  | | **RESOLUTION NUMBER** | | **DATED** |
|  | 1. | | Board of studies Resolution No. 21.1 | | 03-12-2012 |
|  | 2. | | Board of Faculty Resolution No. | |  |
|  | 3. | | Academic Council Resolution No. | | 13-12-2012 |

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| **Title of Subject** | **:** | **Engineering STATICS (ME111)** | | | | | | | |
| **Discipline** | **:** | ME | | First Semester | | | | | |
| **Effective** | **:** | 13 Batch and onwards | | | | | | | |
| **Pre-requisite** | **:** | ……. | | | | | | | |
| **Co-requisite** | **:** | …….. | | | | | | | |
| **Assessment** | **:** | 20% Sessional Work , 20% Mid Semester Examination 60% Written Examination | | | | | | | |
| **Credit Hours** | **:** | 03 | + | | 01 | | | | |
| **Minimum Contact Hours** | **:** | 42 | + | | 42 | **Total Marks:** | 100 | + | 50 |

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| **Aims** | **:** | The study of Engineering Statics should aim at developing an intuitive feeling for the precise mathematical formulation of physical problems and for the physical interpretation of the mathematical solution. |
| **Objectives** | **:** | An important objective of a first course in Engineering Statics is to train the students to think about physical phenomena in mathematical terms. |

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| **Contents** | **:** | **Force System:** Introduction to the subject, fundamental concepts of statics, representation & types of vectors, principle of transmissibility, graphical & analytical methods of vector operation, rectangular and non-rectangular components, cartesian vectors, \position vector.  **Equilibrium of Particle:** Free body diagram of particle in equilibrium, equilibrium of particle for 2D and 3D systems.  **Force System Resultants:** Moment of a force (scalar and vector formulation), moment of force about a specified axis, moment of a couple, resultant of a force and couple systems.  **Equilibrium of Rigid Bodies:**  Free body diagram of rigid bodies in equilibrium, equilibrium of rigid bodies for 2D and 3D systems.  **Frames & Cables:** Free body diagram for frames & machines, cables and beams subjected to various loads.  **Friction:** Characteristics of dry friction, laws of friction, angle of friction, angle of repose, static and dynamic friction, friction on horizontal and inclined planes, wedges.  **Centre of Gravity & Centroid:** Centre of gravity & centre of mass for system of particles, centre of gravity, centre of mass & centroid of rigid bodies. |

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| **Recommended Books:** | | |
|  | 1. | R.C. Hibbler, “Engineering Mechanics (Statics)” latest edition. |
|  | 2. | J.L Meriam, “Engineering Mechanics (Statics)” latest edition. |
|  | 3. | Beer & Johnston, “Vector Mechanics for Engineers (Statics)”, latest edition. |
|  | 4. | Joseph f. Shelley, “Engineering Mechanics (Statics)”, latest edition. |

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| **Approval:** | | | |
|  |  | **RESOLUTION NUMBER** | **DATED** |
|  | 1. | Board of studies Resolution No. 21.2 | 03.12.2012 |
|  | 2. | Board of Faculty Resolution No. |  |
|  | 3. | Academic Council Resolution No. | 13-12-2012 |

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**DEPARTMENT OF MECHANICAL ENGINEERING**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Title of Subject** | : | **ENGINEERING MATERIALS (ME121)** | | | | | | | |
| **Discipline** | : | ME | | First Semester | | | | | |
| **Effective** | : | 13 Batch and onwards | | | | | | | |
| **Pre-requisite** | : | ….. | | | | | | | |
| **Co-requisite** | : | ……. | | | | | | | |
| **Assessment** | : | 20 % Sessional Work, 20% Mid Semester Examination, 60% Written Examination | | | | | | | |
| **Credit Hours** | : | 03 | + | | 00 | | | | |
| **Minimum Contact Hours** | : | 42 | + | | 00 | **Total Marks:** | 100 | + | 00 |

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| **Aims** | : | To provide knowledge regarding various engineering materials, their applications, properties & appropriate selection criterion. |
| **Objectives** | : | On the completion of the course, the students will be able to understand the appropriate use and selection of various materials in engineering applications. |

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| --- | --- | --- |
| **Contents** | : | **Introduction:** Crystalline structure of metals, allotropy, crystallographic planes, slip and slip system, dislocation and twining.  **Production of Iron and Steel and their alloy:** Production of iron wrought iron, cast iron, production of steel and its classification, production of various steel section. alloying elements and their effect on the properties of alloy steel. Ferrite, Austenite, Cementite, Pearlite, Martensite, Banite, etc. phase diagram & iron carbon phase diagram.  **Non-ferrous and their alloy:** Refining of copper, aluminum & zinc, aluminum alloys, zinc alloys, copper alloys brass & bronze, metals & alloys for special applications.  **Heat treatment:** Heat treatment, critical temperature, transformation on heating/cooling, annealing, normalizing, tempering, quenching, austempering, hardening.  **Non-metallic Materials:** Polymer, molecular structure, bonding, plastic & rubber, classification of polymer, compounding forming operation etc., ceramic bonding, properties, ceramic material, crystalline and amorphous glass etc, refractory materials and their types, composite materials and their classifications, glass-fibre reinforced plastics, ceramic-metal composites (Cermets). |

|  |  |  |
| --- | --- | --- |
| **Recommended Books:** | | |
|  | 1.  2. | W. D. Callister, “Material Science and Engineering An Introduction”, John Wiley & Sons.  D. R. Askeland, P.P. Fulay & W. J. Wright, “The Science and Engineering of Materials”, Global Engineering. |
|  | 3. | R. E. Smallman & R. J. Bishop, “Modern Physical Metallurgy & Materials Engineering”, latest edition. |
|  | 4. | G. Renginald Bashforth, “The Manufacturing of Iron & Steel”, Chapman & Hall Ltd, latest edition. |
|  | 5. | Sharma, “Basics of Engineering Materials”, latest edition. |

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| **Approval:** | | | |
|  |  | **RESOLUTION NUMBER** | **DATED** |
|  | 1. | Board of studies Resolution No. 21.2 | 03-12-2012 |
|  | 2. | Board of Faculty Resolution No. |  |
|  | 3. | Academic Council Resolution No. | 13-12-2012 |

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**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | **:** | **ENGINEERING DYNAMICS (ME131)** | | | | | | | |
| **Discipline** | **:** | ME | | Second Semester | | | | | |
| **Effective** | **:** | 13 Batch and onwards | | | | | | | |
| **Pre-requisite** | **:** | Engineering Drawing & Graphics (ME101), Engineering Statics (ME111) | | | | | | | |
| **Co-requisite** | **:** | …….. | | | | | | | |
| **1Assessment** | **:** | 20 % Sessional Work, 80 % Written Examination | | | | | | | |
| **Credit Hours** | **:** | 03 | + | | 00 | | | | |
| **Minimum Contact Hours** | **:** | 42 | + | | 00 | **Total Marks:** | 100 | + | 00 |

|  |  |  |
| --- | --- | --- |
| **Aims** | **:** | To develop an intuitive feeling for the precise mathematical formulation of  physical problems and physical interpretation of the mathematical solution. |
| **Objectives** | **:** | To train the students to think about physical phenomena in mathematical terms. |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contents** | | | **:** | **Kinematics of Particle:** Introduction, rectilinear motion, velocity and acceleration, equations of motion and the graphs of motion for constant and variable acceleration, relative motion, curvilinear motion, projectile motion, tangential and normal components of acceleration, cylindrical components.  **Kinetics of Particle:** Newton’s laws of Motion. D’Alembert’s principle, equation of motion for rectangular, normal & tangential & cylindrical coordinates. work, power, energy, work of force, work-energy equation, law of conservation of energy, efficiency of machine, impulse and momentum, impulse and impulsive force, linear momentum and its conservation, impact & coefficient of restitution, angular momentum and its conservation.  **Kinematics of Rigid body:** Rigid body motion about fixed axes, relative motion analysis,  **Kinetics of Rigid body:** Planer kinetic equation of motion with regard to translation & rotation about a fixed axes, general planer motion, kinetic energy of rotation, work of force & couple, principle of work & energy, conservation of energy, principle of impulse & momentum, conservation of momentum. | | | |
| **Recommended Books:** | | | | | | | |
|  | | 1. | | | | R.C. Hibbler, “Engineering Mechanics (Dynamics)” latest edition. | |
|  | | 2. | | | | J.L Meriam, “Engineering Mechanics (Dynamics)”, latest edition. | |
|  | | 3. | | | | Beer & Johnston, “Vector Mechanics for Engineers (Dynamics)”, latest edition. | |
|  | | 4. | | | | Joseph f. Shelley, “Engineering Mechanics (Dynamics)”, latest edition. | |
|  |  | | | | **RESOLUTION NUMBER** | | **DATE** |
|  | 1. | | | | Board of studies Resolution No. 21.2 | | 03-12-2012 |
|  | 2. | | | | Board of Faculty Resolution No. | |  |
|  | 3. | | | | Academic Council Resolution No. | | 13-12-2012 |

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**Title of Subject** : **WORKSHOP PRACTICE (ME141)**

**Discipline** : Second Semester

**Effective** : 13 Batch and onwards

**Pre-Requisite** : Engineering Materials (ME-121)

**Co-Requisite** : ……

**Assessment** : 10 % Sessional Work, 30% Lab Evaluation Work

60 % Semester Lab. Examination

:

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Credit Hours** | | : | 00 | + | 02 | | | | | |
| **Minimum Contact Hours** | | : | 00 | + | 84 | **Total Marks:** | 00 | + | 100 | |
| **Aims**  : | | This course aims at developing general manual and machining skills in the students. Students are given opportunities to work independently as well as in teams which lead to the development of skills mentioned in the course contents. | | | | | | | | |
| **Objectives**  : | | The main objective of this practical work is to provide students hands on experience about the use of different tools and basic manufacturing processes. | | | | | | | | |
| **Contents**  : | | * Precautions and safety rules. * Introduction to machine tools, classification and their operations   Practical’s: Lathe, Shaper, Milling, Drilling press, basic and elementary tools used in machine Shop.   * Bench fitting: measuring tools, assembly tools, layout tools, filing, sawing, tap & die practice * Wood working: Its kinds and uses, seasoning of wood and tools for wood working. * Forging: Forging tools, types of forging, heat treatment furnaces. * Foundry: Molding and its types, molding tools, molding sands, melting furnaces, types of casting defects & its remedies. * Welding: Types of welding, welding joints, defects in welding and its remedies. | | | | | | | | |
| **Recommended Books:** | | 1.Kempster, “Workshop Technology” 3rd Edition 2010  2. H.D Burghardt “Machine Tools Operation”, latest edition  3. R.A Higgins, “Engineering Metallurgy”, latest edition.  4. W.D Wolansky, “Wood Working Fundamentals”, latest edition.  5. Odams Boo, “General Engineering Workshop Practice”, latest edition | | | | | | | | |

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|  |  | **RESOLUTION NUMBER** | **DATED** |
|  | 1. | Board of studies Resolution No. 21.1 | 03-12-2012 |
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| **Title of Subject** | | | **:** | **STRENGTH OF MATERIALS-I (ME201)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Third Semester | | | | | |
| **Effective** | | | **:** | 13 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Engineering Statics (ME 111), Engineering Materials  (ME 121) | | | | | | | |
| **Co-requisite** | | | **:** | ……. | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional work, 80% Written Examination | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
| **Aims** | **:** | The course aims to introduce basic concepts of stress and strain; shearing force and bending; as well as torsion and deflection of different structural elements. | | | | | | | | | |
| **Objectives** | **:** | After completing this course, students should be able to understand:   * the behavior of materials under different loading conditions * preliminary design process of basic machine components | | | | | | | | | |

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| **Contents** | **:** | **Stress, Strain and Axial Loading:** Stress and strain, elastic stress and strain  behavior of materials, Hooke’s law, lateral strain and Poisson’s ratio, elastic  constants and their relationship, statically determinate and indeterminate  problems in tension and compression, thermal stresses, strain energy,  stresses due to impact loading, stresses on oblique sections, factor of safety,  mechanical properties of materials, stress concentration.  **Biaxial Stresses:** Analysis of biaxial stress, Mohr’s circle for plane stress, plane strain, Mohr’s circle for plane strain, stresses in thin-walled cylinder and spherical shell under internal pressure, principal stresses and volumetric strain.  **Torsion:** Torsion of solid and hallow circular shafts, shear stresses and twist in solid and hollow circular shafts, strain energy in torsion and shear.  **Stresses in Beams:** Shear force and bending moment diagrams for simply supported and cantilever beams, relationship between loading shear force and bending moment, simple bending theory of beams, bending and shear stresses in beams.  **Centroids and Moments of Inertia:** Centroids of irregular sections, moment of inertia of an area, product of inertia for an area**,** moment of inertia for composite sections, moment of inertia with respect to inclined axis.  **Deflection of Beams:** Differential equation of deflection curve, deflection of simply supported and cantilever beams, deflection by integration of bending moment equation, deflection by integration of shear force and load equations. |

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| **Recommended Books:** | | | | | |
|  | | 1. | | Ferdinand P. Beer, E. Russel Johnston Jr., John T. Dewolf, “Mechanics of Materials”, McGraw Hill, 5th Edition, (SI units), 2010. | |
|  | | 2. | | J.M. Gere and S.P.Timoshenko,”Mechanics of Materials”, Cengage Learning, 8th Edition, 2012. | |
|  | | 3. | | Ansel C. Ugural,“Mechanics of Materials”, Wiley, 1st Edition, 2007 | |
|  | | 5. | | Arthur P. Boresi Richard J. Schmidit., “Advanced Mechanics of Materials”, Wiley, 6th Edition, 2002 | |
|  | | 6. | | Benham and Crawford., “Mechanics of Materials”, Prentice Hall, 2nd edition, 1996. | |
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| **Approval:** | | | |
|  |  | **RESOLUTION NUMBER** | **DATED** |
|  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 |
|  | 2. | Board of Faculty Resolution No. |  |
|  | 3. | Academic Council Resolution No. | 31.07.2013 |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **MECHANICS OF MACHINES-I (ME 211)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Third Semester | | | | | |
| **Effective** | | | **:** | 13 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Engineering Dynamics (ME 131) | | | | | | | |
| **Co-requisite** | | | **:** | ……….. | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination. | | | | | | | |
| **Credit Hours** | | | **:** | 02 | + | | 00 | **Total Marks:** | 50 | + | 00 |
| **Contact Hours** | | | **:** | 02 | + | | 00 | **Min. Contact hrs/semester** | 28 | + | 00 |
| **Aims** | **:** | To develop substantial and adequate foundation in the analysis of various mechanisms. | | | | | | | | | |
| **Objectives** | **:** | To impart the students with the basic knowledge of the members of a machine in a coordinated motion. | | | | | | | | | |

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| **Contents** | **:** | **Introduction:** Types of motion, mechanism and inversions, quick return mechanism, universal joint, steering wheel mechanism.  **Linkages:** Velocity and acceleration analysis, instantaneous centre method, relative velocity method, analytical method of velocity and acceleration of slider crank mechanism, forces in slider crank mechanism.  **Brakes and dynamometers:** Types and their working mechanism. |

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| **Recommended Books:** | | |
|  | 1. | J.E. Shigley, “Theory of Machines”, McGraw Hill,1st Edition, 1961. |
|  | 2. | David H. Myszka, “Machines and Mechanisms”, Prentice Hall, 3rd Edition, 2005. |
|  | 3. | J.E. Shigley, John Joseph Uicker Jr. “Theory of Machines and Mechanisms”, McGraw Hill, 2nd Edition, 1995. |
|  | 4. | [R. S. Khurmi](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22R.+S.+Khurmi%22&source=gbs_metadata_r&cad=5), [J. K. Gupta](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22J.+K.+Gupta%22&source=gbs_metadata_r&cad=5), “Theory of Machines”, Eurasia Publishing House, 14th Edition, 2008. |

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| **Approval:** | | | |
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|  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 |
|  | 2. | Board of Faculty Resolution No. |  |
|  | 3. | Academic Council Resolution No. | 31-07-2013 |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **THERMODYNAMICS-I (ME 221)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Third Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | ……. | | | | | | | |
| **Co-requisite** | | | **:** | ……. | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
| **Aims** | **:** | To make students acquainted with the basic principles of classical Thermodynamics to develop an intuitive understanding. | | | | | | | | | |
| **Objectives** | **:** | After studying the course, students should be able to assess the thermal systems. | | | | | | | | | |

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| **Contents** | **:** | **Introduction to Thermodynamics:** Application areas, thermodynamic systems, properties, state, processes and cycles, pure substances, ideal gas and ideal gas equation of state, work and heat, forms of work, energy and forms of energy, energy transfer by heat and work.  **Laws of Thermodynamics**: the first law of thermodynamics, cyclic processes and non cyclic processes applied to closed and open systems, stored energy, internal energy, flow energy, enthalpy, specific heats, energy analysis of different thermodynamic systems, law-I efficiencies, energy reservoirs**, h**eat engines, refrigerators and heat pumps, statements of the second law of thermodynamics, perpetual motion machines, reversible and irreversible processes, Carnot cycle, the Carnot theorems/principles, thermodynamic temperature scale, Carnot heat engine.  **Entropy:** Clausius inequality,entropy; increase of entropy principle, isentropic process, entropy as a coordinate, Gibbs equation, entropy change of ideal gases, entropy balance: entropy change, entropy transfer, entropy generation, closed and open systems entropy balance.  **Exergy / availability:** Reversible work and irreversibility, law-II efficiency, exergy balance: exergy changes, exergy transfer, exergy generation, closed and open systems.  **Gas power cycles:** Air standard assumptions; Otto cycle, Diesel cycle, Dual cycle, Stirling and Ericson cycles, Brayton cycle.  **Properties of steam and vapor power cycle:** Processes in formation of steam, property diagrams; property tables, Rankine cycle. |

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| **Recommended Books:** [Yunus A. Cengel](http://www.goodreads.com/author/show/16239.Yunus_A_Cengel), [Michael A. Boles](http://www.goodreads.com/author/show/40696.Michael_A_Boles),” Thermodynamics: An Engineering Approach”, McGraw-Hill, 7th Edition, 2001.Sanford Klein, Gregory Nellis,” Thermodynamics”, Cambridge University Press, 1st Edition, 2008.[Michael J. Moran](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22Michael+J.+Moran%22), [Howard N. Shapiro](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22Howard+N.+Shapiro%22), [Daisie D. Boettner](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22Daisie+D.+Boettner%22), [Margaret Bailey](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22Margaret+Bailey%22),“ Fundamentals of Engineering Thermodynamics”, John Wiley & Sons, 7th Edition, 2010.[Thomas Deas Eastop](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22Thomas+Deas+Eastop%22), “Applied Thermodynamics for Engineering Technologists”, Pearson Education, 5th Edition, 1963.  |  |  |  |  | | --- | --- | --- | --- | | **Approval:** | | | | |  |  | **RESOLUTION NUMBER** | **DATED** | |  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 | |  | 2. | Board of Faculty Resolution No. |  | |  | 3. | Academic Council Resolution No. | 31-07-2013 | |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **STRENGTH OF MATERIALS-II (ME 231)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Fourth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Strength of Materials-I (ME 201) | | | | | | | |
| **Co-requisite** | | | **:** | ……. | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 00 | **Total Marks:** | 100 | + | 00 |
| **Contact Hours** | | | **:** | 03 | + | | 00 | **Min. Contact hrs/semester** | 42 | + | 00 |
| **Aims** | **:** | To develop the understanding about design of various machine components subjected to complex stress systems. | | | | | | | | | |
| **Objectives** | **:** | This course enables students to develop the solution of various stresses, strain problems by satisfying equilibrium, compatibility and boundary conditions. | | | | | | | | | |

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| **Contents** | | | **:** | **Theory of Columns:** Failure of column, Euler’s theory of buckling, equivalent length of a column, end conditions of a column, slenderness ratio, limitations of Euler’s column theory, eccentric loading of long columns, empirical design formulae for columns.  **Theories of Failure:** Theories of failure and their graphical representations.  **Triaxial Stress Analysis:** Principal triaxial stresses and strains, volumetric strain, strain energy and resilience of triaxial stress.  **Thick-Walled Cylinders:** Lame’s theory, radial and hoop stresses in thick-walled cylinders under internal pressure, special cases.  **Bending in Beams:** Bending of curved beams with small initial curvature, bending of curved beams with large initial curvature, crane hooks.  **Plastic Bending of Beams:** Plastic behaviour of materials, plastic bending of symmetrical sections, shape factors of various geometric shapes, residual stresses in elasto-plastic and fully plastic conditions.  **Unsymmetrical Bending:** Introduction to unsymmetrical bending, stress at a point due to unsymmetrical bending, direction of principal and neutral axis.  **Creep and Fatigue:**  Creep and its mechanism of failure, various parameter methods to calculate time required to cause rupture by creep, fatigue behaviour of materials, mechanism of fatigue failure, fatigue loads and stresses, stress concentration and notches, S-N curves.  **Energy Methods:** Castigliano’s theorem, Max well theorem, Rayleigh Ritz method. | |
| **Recommended Books:** | | | | | |
|  | | 1.  2. | | | Dr. Kamal Kumar, “ Advanced Mechanics of Materials”, Khana Publishers, 6th Edition, 1986.  Benham and Crawford., “Mechanics of Materials”, Prentice Hall, 2nd Edition, 1996. |
|  | | 3. | | | J.M. Gere and S.P.Timoshenko,”Mechanics of Materials”, Cengage Learning, 8th Edition, 2012. |
|  | | 4. | | | Ansel C. Ugural,“Mechanics of Materials”, Wiley, 1st Edition, 2007 |
|  | | 5. | | | R.C Hibbeler, “Mechanics of Materials” Prentice Hall, 9th Edition, 2011. |
| |  |  |  |  | | --- | --- | --- | --- | | **Approval:** | | | | |  |  | **RESOLUTION NUMBER** | **DATED** | |  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 | |  | 2. | Board of Faculty Resolution No. |  | |  | 3. | Academic Council Resolution No. | 31-07-2013 | | | | | | |

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**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **THERMODYNAMICS-II (ME 241)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Fourth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Thermodynamics-I (ME 221) | | | | | | | |
| **Co-requisite** | | | **:** | ……. | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
| **Aims** | **:** | To make students understand, the principles of design, operation and energy analysis of different thermodynamic system s. | | | | | | | | | |
| **Objectives** | **:** | After studying the course, students should be able to deal with real-world engineering problems associated with thermal systems. | | | | | | | | | |

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| **Contents** | | **:** | | **Fuels & combustion**: Theoretical & actual combustion processes, enthalpy of formation & enthalpy of combustion, first law analysis of reacting systems, adiabatic flame temperature, entropy change of reacting systems.  **Steam generators:** Classification & working of different types of steam generators, construction, mountings and accessories, methods to calculate the performance of steam generators, heat balance sheets, draught and its classification, introduction to furnaces, classification according to type of fuel used, combustion process in the furnace.  **Nozzles:** General flow analysis (one-dimensional) through nozzles, effect of varying area in subsonic and supersonic flow, isentropic flow with varying area, maximum flow rate through nozzle, critical pressure ratio, effect of back pressure on mass flow rate, under expansion and overexpansion nozzles, nozzle efficiency, coefficients for nozzle, steam nozzle analysis (supersaturated flow), stagnation condition and effects of friction.    **Steam turbines:** Classification of steam turbines, flow of steam, over blade, velocity diagrams, stage efficiency, diagram efficiency overall efficiency and reheat factor, compounding of steam turbine for velocity, pressure and pressure-velocity losses in the steam turbines, governing and control.  **Gas turbines:** Gas turbine cycles, Brayton cycle (ideal, actual, and modified), developments in gas turbines, applications, combustion process.  **Air compressors:** Classification of air compressors, working of reciprocating air compressors, compression processes, isothermal efficiency, methods of increasing isothermal efficiency, effects of cylinder clearance, volumetric efficiency, multistage compression and inter coolers, conditions for maximum efficiency, steady-flow energy analysis, introduction to rotary compressors, performance of rotary compressors. | |
| **Recommended Books:** | | | | |
|  |  | | 1. Yunus Cengel & M. Boles; “Thermodynamics: An engineering approach”, McGraw Hill, 5th Edition, 2010. 2. R. Joel “Basic Engineering Thermodynamics”, Prentice Hall, 5th Edition, 1997. 3. T.D.Eastop & A.McConkey, “Applied Thermodynamics for Engineering Technologies”, Longman Scientific and Technical, 5th Edition, 1997. 4. [Bhalchandra V. Karlekar](http://www.amazon.com/Bhalchandra-V.-Karlekar/e/B001KI4PYS/ref=ntt_athr_dp_pel_1) “Thermodynamics for Engineers”, Prentice Hall College Div, 1st Edition, 1982. | |
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|  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 |
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|  | 3. | Academic Council Resolution No. | 31-07-2013 |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **FLUID MECHANICS – I (ME 251)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Fourth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | ……. | | | | | | | |
| **Co-requisite** | | | **:** | ……. | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination. | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
| **Aims** | **:** | The course aims to deliver sound understanding of the basic concepts of fluid mechanics | | | | | | | | | |
| **Objectives** | **:** | At the end of this course, students are expected to acquire the basic understanding both in fluid statics, and fluid dynamics. | | | | | | | | | |

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| **Contents** | | **:** | **Introduction**: Fluid properties, continuum hypothesis, no slip condition, fluid energy, Newtonian and non-Newtonian fluids.  **Fluid Statics:** Pressure, pressure measuring devices, hydrostatic stress, equation in differential and integral form, hydrostatic force on submerged plane, inclined and curved surfaces, buoyancy and flotation, stability of immersed and floating body.  **Fluid Kinematics:** Eulerian and Lagragian description, flow pattern and flow visualization, types of flow lines, velocity gradient, vorticity and circulation, velocity potential and stream function.  **Fluid Dynamics:**  Reynolds transport theorem, continuity equation, momentum equation, Bernoulli’s theorem and energy equation.    **Fluid Flow through Conduits**: Reynolds experiment, laminar & turbulent flow in pipes, flow losses in pipes, piping network and pump selection, fluid flow between two parallel plates, kinetic energy and momentum correction factor.  **Dimensional Analysis & Similitude:** Dimensions and units, dimensional homogeneity, dimensional analysis methods, model studies, similitude, dimensionless numbers. | | |
| **Recommended Books:**   1. Yunus. A Cengel, “ Fluid Mechanics: Fundamental & Applications” (in SI units)”, Tata McGraw Hill, 2nd Edition, 2010. 2. [I.G. Currie](http://www.taylorandfrancis.com/books/search/author/ig_currie/)**, “**[Fundamental Mechanics of Fluids”,](http://www.taylorandfrancis.com/books/details/9781439874608/)  CRC Press, 4th edition, 2012. 3. [**Edward J. Shaughnessy**](http://www.amazon.com/s/ref=ntt_athr_dp_sr_1?_encoding=UTF8&field-author=Edward%20J.%20Shaughnessy&search-alias=books&sort=relevancerank)**,**[**Ira M. Katz**](http://www.amazon.com/s/ref=ntt_athr_dp_sr_2?_encoding=UTF8&field-author=Ira%20M.%20Katz&search-alias=books&sort=relevancerank)**,** [**James P. Schaffer**](http://www.amazon.com/s/ref=ntt_athr_dp_sr_3?_encoding=UTF8&field-author=James%20P.%20Schaffer&search-alias=books&sort=relevancerank)**,” Introduction to Fluid Mechanics”, Oxford University Press, 1st edition, 2004.** 4. [**Clayton T. Crowe**](http://www.amazon.com/s/ref=ntt_athr_dp_sr_1?_encoding=UTF8&field-author=Clayton%20T.%20Crowe&search-alias=books&sort=relevancerank)**,** [**Donald F. Elger**](http://www.amazon.com/s/ref=ntt_athr_dp_sr_2?_encoding=UTF8&field-author=Donald%20F.%20Elger&search-alias=books&sort=relevancerank)**,** [**John A. Roberson**](http://www.amazon.com/s/ref=ntt_athr_dp_sr_3?_encoding=UTF8&field-author=John%20A.%20Roberson&search-alias=books&sort=relevancerank)**, “Engineering Fluid Mechanics” , John Wiley & Sons; 8th Edition, 2004.** 5. **F.M White,” Fluid Mechanics”, McGraw Hill, 4th Edition, 1999.** 6. Dr. R.K. Bansal,” A Text book of Fluid Mechanics”, 1st Edition, 2008. 7. Dr. R.K. Bansal,” A Text book of Fluid Mechanics & Hydraulic Machines (SI System)”, 9th Edition, 2005. 8. R.K. Rajput, “Fluid Mechanics & Hydraulic Machines”,S. Chand Ltd., 4th Edition, 2008.  |  |  |  |  | | --- | --- | --- | --- | | **Approval:** | | | | |  |  | **RESOLUTION NUMBER** | **DATED** | |  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 | |  | 2. | Board of Faculty Resolution No. |  | |  | 3. | Academic Council Resolution No. | 31-07-2013 | | | | | | |
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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **MECHANICS OF MACHINES – II (ME 261)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Fourth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Mechanics of Machines-I(ME 211) | | | | | | | |
| **Co-requisite** | | | **:** | ……. | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination. | | | | | | | |
| **Credit Hours** | | | **:** | 02 | + | | 01 | **Total Marks:** | 50 | + | 50 |
| **Contact Hours** | | | **:** | 02 | + | | 03 | **Min. Contact hrs/semester** | 28 | + | 42 |
| **Aims** | **:** | To develop substantial and adequate foundation in the analysis of various mechanisms. | | | | | | | | | |
| **Objectives** | **:** | To impart the students with the basic knowledge of the members of a machine in a coordinated motion. | | | | | | | | | |

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| **Contents** | | **:** | **Fly wheel and turning moment diagram:** Turning moment diagram of single and multi cylinder I.C engine, energy stored by fly wheel.    **Cams and follower:** Types, displacement diagram, types of follower motion, drawing of cam profile, velocity and acceleration of follower.  **Balancing:** Balancing of rotating masses in single and different planes, balancing of reciprocating masses, balancing of single cylinder and multi cylinder in-line engines, balancing of V-Engines. | |
| **Recommended Books:** | | | | |
|  | 1. | | | J.E. Shigley, “Theory of Machines”, McGraw Hill, 1st Edition, 1961. |
|  | 2. | | | David H. Myszka, “Machines and Mechanisms”, Prentice Hall, 3rd Edition, 2005. |
|  | 3. | | | J.E. Shigley, John Joseph Uicker Jr. “Theory of Machines and Mechanisms”, McGraw Hill, 2nd Edition, 1995. |
|  | 4. | | | [R. S. Khurmi](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22R.+S.+Khurmi%22&source=gbs_metadata_r&cad=5), [J. K. Gupta](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22J.+K.+Gupta%22&source=gbs_metadata_r&cad=5), “Theory of Machines”, Eurasia Publishing House, 14th Eedition, 2008 |

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| **Approval:** | | | |
|  |  | **RESOLUTION NUMBER** | **DATED** |
|  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 |
|  | 2. | Board of Faculty Resolution No. |  |
|  | 3. | Academic Council Resolution No. | 31-07-2013 |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **HEAT AND MASS TRANSFER (ME 301)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Fifth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Thermodynamics II(ME 241), Fluid Mechanics-I(ME 251) | | | | | | | |
| **Co-requisite** | | | **:** | Applied Aerodynamics (ME 311), Fluid Mechanics-II(ME321) | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
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| **Aims** | **:** | To impart the knowledge of basic laws of heat transfer and their applications. | | | | | | | | | | |
| **Objectives** | **:** | To enable the students to learn main mechanical components of industries e.g. heat exchangers, boilers, condensers, evaporators. | | | | | | | | | | |
| **Contents** | **:** | **Introduction:**  **Intro Introduction:** Importance of subject, three modes of heat transfer, steady, unsteady state, Fourier’s law of heat conduction, basic terminology, thermal conductivity, dimensions and units.  **Conduction of Heat Transfer:** One dimensional heat conduction through plane wall, composite wall, cylinder, sphere, effect of variable thermal conductivity, over all heat transfer coefficient, critical radius of insulation, heat source problem of wall, cylinder, and sphere, fins.  **Convection Heat Transfer:** Convection heat transfer numbers, bulk temperature, heat transfer in laminar and turbulent flow for various geometrical shapes, thermal laminar and turbulent boundary layers.  **Heat Exchanger:** Typesofheat exchanger, LMTD, NTU methods, selection and design of heat exchangers.  **Radiation Heat Transfer:** Boltzmann’s law, properties of radiation, environmental radiation, momentum, heat transfer analogy, Kirchoft’s law and shape factor.  **Mass Transfer**: Introduction, analogy between heat and mass transfer,  mass diffusion, Ficks law, simultaneous heat and mass transfer. | | | | | | | | | | |

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| **Recommended Books:** | | |
|  |  | 1. Yunus Cengel and [Afshin Ghajar](http://www.amazon.com/s/ref=ntt_athr_dp_sr_2?_encoding=UTF8&field-author=Afshin%20Ghajar&search-alias=books&sort=relevancerank),“Heat and Mass Transfer: Fundamentals and applications+ EES DVD for Heat and Mass Transfer ”, McGraw Hill, 4th Edition, 2010. 2. [Theodore L. Bergman](http://www.amazon.com/s/ref=ntt_athr_dp_sr_1?_encoding=UTF8&field-author=Theodore%20L.%20Bergman&search-alias=books&sort=relevancerank) , [Adrienne S. Lavine](http://www.amazon.com/s/ref=ntt_athr_dp_sr_2?_encoding=UTF8&field-author=Adrienne%20S.%20Lavine&search-alias=books&sort=relevancerank), [Frank P. Incropera](http://www.amazon.com/s/ref=ntt_athr_dp_sr_3?_encoding=UTF8&field-author=Frank%20P.%20Incropera&search-alias=books&sort=relevancerank), [David P. DeWitt](http://www.amazon.com/s/ref=ntt_athr_dp_sr_4?_encoding=UTF8&field-author=David%20P.%20DeWitt&search-alias=books&sort=relevancerank), “Fundamentals of Heat & Mass Transfer”, John Wiley & Sons, Inc., 7th Edition, 2011. 3. Holman, “Heat Transfer”, Mcgraw-Hill Series in Mechanical Engineering, 9th Edition, 2010. |

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**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **APPLIED AERODYNAMICS (ME 311)** | | | | | | | |
| **Discipline** | | | **:** | ME | | FifthSemester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Thermodynamics II (ME 241), Fluid Mechanics-I (ME 251) | | | | | | | |
| **Co-requisite** | | | **:** | Heat & Mass Transfer (ME 301) | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | |
| **Credit Hours** | | | **:** | 02 | + | | 01 | **Total Marks:** | 50 | + | 50 |
| **Contact Hours** | | | **:** | 02 | + | | 03 | **Min. Contact hrs/semester** | 28 | + | 42 |
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| **Aims** | **:** | To familiarize the students with aerodynamics of flight. | | | | | | | | | |
| **Objectives** | **:** | To give the students a thorough understanding of fluid flow problems and analysis of the problems arising from flight and other topics involving the flow of air. | | | | | | | | | |

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| **Contents** | **:** | **Atmosphere:** Introduction, aerodynamics and its evolution, atmosphere and its properties, viscosity temperature models for atmosphere, atmosphere standards (ISA)  **Incompressible and In-viscid flow:** Introduction, Bernoulli’s equation, flow through venture tubes and wind tunnels, Pitot static tube, pressure coefficient, Laplace equation, uniform flow, source or sink flow, combination of uniform and source flow, doublet flow, vortex flow, lifting and non-lifting flow over cylinder.  **Flow over airfoils and wings:** Introduction, aerodynamic forces, moments and coefficients, aerodynamic center and center of pressure, airfoil nomenclature, airfoil characteristics, high lift airfoil sections, wing geometry parameters, down wash and induced drag, delta wing and swept wing.  **Compressible flow:** Introduction, speed of sound, Mach number, flow regimes based on Mach number, stagnation properties, special forms of energy equation, isentropic flow in a variable area stream tube, normal and oblique shock waves, measurement of air speed in compressible fluid flow.  **Propulsion:** Introduction, Froude’s momentum theory, turbojet, turbofan, turboprop, helicopter rotor dynamics, energy analysis. |

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| **Recommended Books:**   1. Anderson J.D.(Jr), “Fundamental of Aerodynamics”, McGraw-Hill, 5th Edition, 2010. 2. John. J Bertin and Russell M Cummings, “Aerodynamics for Engineers”, Prentice Hall, 5th Edition, 2008. 3. [Barnes W. McCormick](http://www.amazon.com/s/ref=ntt_athr_dp_sr_1?_encoding=UTF8&field-author=Barnes%20W.%20McCormick&search-alias=books&sort=relevancerank), “Aerodynamics, Aeronautics, and Flight Mechanics”, Wiley, 2nd Edition, 1994. 4. [Frederic P. Miller](http://www.goodreads.com/author/show/2940867.Frederic_P_Miller), [Agnes F. Vandome](http://www.goodreads.com/author/show/2940868.Agnes_F_Vandome), [John McBrewster](http://www.goodreads.com/author/show/2940866.John_McBrewster), “Automotive Aerodynamics”, Alphascript Publishing, 1st Edition, 2010. 5. Houghton, E. I., Carpenter, P. W., Collicott, S. H., Valentine, D. T., “Aerodynamics for Engineering Students”, Butterworth-Heinemann, 6th Edition, 2012. | | |
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| **Title of Subject** | | | **:** | **FLUID MECHANICS – II (ME 321)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Fifth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Fluid Mechanics – I (ME 251) | | | | | | | |
| **Co-requisite** | | | **:** | Heat & Mass Transfer (ME 301) | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
| **Aims** | **:** | To provide adequate knowledge regarding advance methods and applications in fluid mechanics. | | | | | | | | | |
| **Objectives** | **:** | After successful completion of this course, the students would be able to understanding in different problems of fluid mechanics. | | | | | | | | | |

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| **Contents** | **:** | **Navier Stokes equations of motion:** Navier-Stokes equation in Cartesian and polar co-ordinates, limiting cases of Navier-Stoke equation, simple application of Navier–stoke.  **Numerical Methods in fluid flow**: Numerical methods in fluid flow, finite difference method, numerical solutions of Navier-stoke equation in different cases, turbulence modeling, computational fluid dynamics (CFD).  **Boundary layer theory:** Introduction, boundary layer definitions and characteristics, laminar boundary layer, turbulent boundary layer, total drag due to laminar and turbulent layers, boundary layer separation and its control.  **Hydraulic Turbines:** Introduction, classification of hydraulic turbines, draft tube, specific speed, performance characteristics of hydraulic turbines, governing of hydraulic turbines, cavitations, selection of turbines.  **Pumps:**  **(i) Centrifugal pumps**:Component parts of a centrifugal pump, work done by impeller on liquid, losses and efficiencies of centrifugal pump, effect of variation of discharge on the efficiency, specific speed, characteristics of centrifugal pumps, priming of a centrifugal pump, selection of pumps*.*  **(ii) Reciprocating pumps:** Main components and working of reciprocating pump, co-efficient of discharge and slip of reciprocating pump, effect of acceleration of piston on velocity and pressure in the suction and delivery pipes.  **Fluid Systems:** Hydraulic press jack, hydraulic ram, hydraulic intensifier, hydraulic crane, hydraulic accumulator, air lift pump, hydraulic coupling. |
| **Recommended Books:**   1. John M. Gib & Yunus. A Cengel, “ Essential od Fluid Mechanics Fundamentals & Applications”, Mc Graw Hill, 1st Edition, 2006. 2. R.K. Rajput, “Fluid Mechanics & Power Engineering”, S.C Chand, 4th Edition, 2008. 3. J.H. Ferziger, M.Peric,” Computational Methods for Fluid Dynamics”, Springer, 3rd Edition,2002. 4. Edward J. Shanghnessy, Jr. Ira M. Katz & James P. Schaffer,” Introduction to Fluid Mechanics”, Oxford University Press, 1st Edition, 2005. 5. Clayton T. Crowa, Douald F. Elger & John A. Roberson,” Engineering Fluid Mechanics”, John Wiley,10th Edition, 2012. 6. F.M.White,” Fluid Mechanics”, McGraw Hill, 6th Edition , 2008. 7. Wendt J.F,” Computational Fluid Dynamics: an Introduction”,Springer,Verlag,Berlin, 3rd Edition, 2009. 8. Versteeg H.K & W. Malalasekra,” An Introduction to Computational Fluid Dynamics”, Dorling Kindersley, Pearson Education, 2nd Edition, 2008. 9. Dr. R.K. Bansal,” A Text book of Fluid Mechanics & Hydraulic Machines (SI System)”, Laxmi Publications Pvt Limited, 9th Edition, 2005. 10. R.K. Rajput, “Fluid Mechanics & Hydraulic Machines”, S. Chand, 4th Edition, 2008. | | |

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| **Title of Subject** | | | **:** | **MACHINE DESIGN & CAD – I (ME 331)** | | | | | | | |
| **Discipline** | | | **:** | ME | | FifthSemester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Strength of Materials II (ME 231), Mechanics of MachinesII (ME 261) | | | | | | | |
| **Co-requisite** | | | **:** | …….. | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination. | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 00 | **Total Marks:** | 100 | + | 00 |
| **Contact Hours** | | | **:** | 03 | + | | 00 | **Min. Contact hrs/semester** | 42 | + | 00 |
| **Aims** | **:** | This course teaches the fundamental knowledge of design of machine elements. It also helps the students understand some of the many constraints and requirements that may be placed on a design. | | | | | | | | | |
| **Objectives** | **:** | To equip the students to the theory and design of common machine elements. To impart students an experience to solve design problems. | | | | | | | | | |

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| **Contents** | **:** | **Introduction:** The design process, needs analysis, concept of contrivances or conceptualization, basic system concepts, optimization, cost evaluation, characteristics of a designer, standardization.  **Springs – Helical and Leaf:** Primary functions of springs, spring materials, design of helical springs, surge and vibration, buckling of compression springs, spring design formulae and general data, standard wire size, helical springs subjected to fatigue loading, stresses and deflection in helical springs of non- circular wire construction of leaf spring, equalized stresses in spring leaves (Nipping), standard sizes of automobile suspension springs.  **Riveted Joints:** Introduction, material for rivets, types of joints, design of riveted joint, modes of failure, efficiency of joint, general considerations, structural joints, boiler joints.  **Welded Joints:** Introduction, types of joints, failure of fillet welds, static loading, strength of fillet welded joints, eccentric loading, welds subjected to fatigue loading.  **Machine Rods:** Design of push rod, connecting rod and piston rod.  **Cotter and knuckle joints:** Types of cotter joints, design of: socket and spigot cotter joint, sleeve and cotter joint, gib and cotter joint, method of failure of knuckle joint, design procedure of knuckle joint.    **Spur Gears:** Introduction, design considerations of a gear drive, beam strength of gear teeth (Lewis equation), tooth loads (dynamic, static and wear), causes of gear tooth failure, design procedure for spur gears.  **Helical Gears:** Introduction, equivalent spur gear and virtual number of teeth, design equation for helical gears, force analysis.  **Bevel Gears:** Introduction, formative or equivalent number of teeth for bevel gears, forces acting on a bevel gears, design of a shaft for bevel gears.  **Power Screws:** Introduction, torque and efficiency of power screw, stress analysis of power screws, design of screw Jack, differential and compound screws.  **CAD:** Design and analysis of some selected mechanical systems using suitable CAD packages. |

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| **Recommended Books:** | | |
|  | 1. | Robert L. Mott., “Machine Elements in Mechanical Design”, Prentice Hall, 4th Edition, 2004. |
|  | 2. | Robert L. Norton, “Machine Design An Integrated Approach”, Prentice Hall, 2nd Edition, 2001. |
|  | 3. | M.F. Spotts, “Design of Machine Elements”, Prentice Hall, 8th Edition, 2004. |
|  | 4. | J.E. Shigley, C.R. Mischke and R.G. Budynas, “Mechanical Engineering Design”, McGraw Hill, 7th Edition, 2005. |
|  | 5. | V.B. Bhandari, “Design of Machine Elements”, Tata McGraw-Hill, 3rd Edition, 2010. |

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**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **INSTRUMENTATION AND CONTROL (ME 341)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Sixth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Basic Electronics (ES 281) | | | | | | | |
| **Co-requisite** | | | **:** | …….. | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination. | | | | | | | |
| **Credit Hours** | | | **:** | 02 | + | | 01 | **Total Marks:** | 50 | + | 50 |
| **Contact Hours** | | | **:** | 02 | + | | 03 | **Min. Contact hrs/semester** | 28 | + | 42 |
| **Aims** | **:** | To impart the knowledge regarding the instrumentation and control of machines. | | | | | | | | | |
| **Objectives** | **:** | After completing this course, the students will be able to understand the working mechanism of different instruments and their applications. | | | | | | | | | |

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| **Contents** | **:** | **Instrumentation:** Introduction, characteristics of instruments, calibration and traceability, basic elements of instrumentation, introduction to sensors / transducers, signal conditioning and display / recorders.  **Applied Instrumentations:** Measurement systems used for displacement,velocity, acceleration, vibration, temperature, force, pressure, torque, stress, strain, power, viscosity, liquid level, thickness, fluid flow and light.  **Control:** Introduction, Laplace transform, types of loop system, feedback/close loop control, elements of close loop control and transfer function of positive and negative feedback control, industrial controllers, system response and its types, control system response. |

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| **Recommended Books:**   1. Haslam & Summers & Williams, “Engineering Instrumentation and Control”, Edward Arnold, 1st Edition, 1981. 2. W. Bolton, “Control Engineering “,Butterworth, 2nd Edition 1998. 3. J.B Gupta, “Course in Electronics and Electrical Measurements and Instrumentation”, S.K. Kataria, 13th Edition, 2009. 4. Thomas G. Beckwith, Roy D. Marangoni, John H. Lienhard, “Mechanical Measurements”,Pearson, 6th Edition, 2007. 5. James W. Dally, William F. Riley, Kenneth G. McConnell, “Instrumentation for Engineering Measurements”, Wiley, 2nd Edition, 1993. | | | |
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|  | |  |  |  |  | | --- | --- | --- | --- | | **Approval:** | | | | |  |  | **RESOLUTION NUMBER** | **DATED** | |  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 | |  | 2. | Board of Faculty Resolution No. |  | |  | 3. | Academic Council Resolution No. | 31-07-2013 | |  |  |

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| **Title of Subject** | | | **:** | **MACHINE DESIGN & CAD – II (ME 351)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Sixth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Strength Of Materials II(ME 231), Machine Design & CAD-I (ME 331) | | | | | | | |
| **Co-requisite** | | | **:** | Mechanical Vibrations (ME 381) | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination. | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
| **Aims** | **:** | To acquaint the students with the design methods of various machine members | | | | | | | | | |
| **Objectives** | **:** | To equip the students to the theory and design of common machine elements. To impart students an experience to solve design problems. | | | | | | | | | |

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| **Contents** | **:** | **Shaft Design:** Introduction, transmission shafts, shaft design on the strength basis, shaft design on torsional rigidity basis, ASME code for shaft design, design of hollow shaft on strength basis, design of hollow shaft on torsional rigidity basis, flexible shafts.  **Keys and Couplings:** Types of keys, design of square and flat keys, design of Kennedy keys, splines, types of coupling, design procedure for muff, clamp, rigid flange and bushed pin flexible couplings.  **Design / Selection of Friction clutches:** Introduction, principles of friction clutches, practical design aspects, theory of centrifugal clutch.  **Design / Selection of Brakes:** Types of brakes, material of brake lining, design of brakes.  **Design / Selection of V-belt and Rope drives:** Introduction, types of belts, Strength of belt, creep, design procedure,Construction of wire ropes, designation of wire ropes, stresses in wire ropes, design procedure for a wire rope.  **Design / Selection of Bearings:** Sliding contact bearing, types of sliding contact bearings, assumptions in hydrodynamic lubricated bearings, sliding contact bearing materials, lubricants, terms used in hydrodynamic journal bearings, design procedure for journal bearing, design of bearing caps and bolts, rolling contact bearing, construction and types, standard dimensions and designation of ball bearings, static equivalent load, life of bearing, basic dynamic load rating, dynamic equivalent load, dynamic load rating for rolling contact bearing under variable load, reliability of a bearing, selection of radial ball bearings, lubrication of Ball and roller bearings.  **Design of Flywheel:** Introduction, energy stored in a flywheel, stresses in a flywheel rim, stresses in flywheel arms, construction of flywheels.  **CAD:** Design and analysis of some selected mechanical systems using suitable CAD packages. |

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| **Recommended Books:** | | |
|  | 1. | Robert L. Mott., “Machine Elements in Mechanical Design”, Prentice Hall, 4th Edition, 2004. |
|  | 2. | Robert L. Norton, “Machine Design An Integrated Approach”, Prentice Hall, 2nd Edition, 2001. |
|  | 3. | M.F. Spotts, “Design of Machine Elements”, Prentice Hall, 8th Edition, 2004. |
|  | 4. | J.E. Shigley, C.R. Mischke and R.G. Budynas, “Mechanical Engineering Design”, McGraw Hill, 7th Edition, 2005. |
|  | 5. | V.B. Bhandari, “Design of Machine Elements”, Tata McGraw-Hill, 3rd Edition, 2010. |

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| **Title of Subject** | | | **:** | **HEATING, VENTILATION AND AIR CONDITIONING (ME 371)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Sixth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Heat & Mass Transfer (ME 301) | | | | | | | |
| **Co-requisite** | | | **:** | --- | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
| **Aims** | **:** | To teach the students about refrigeration and air conditioning system design concepts. | | | | | | | | | |
| **Objectives** | **:** | After studying the course, students should have basic ideas about cycle analysis and designing parameters pertaining to refrigeration and air conditioning systems. . | | | | | | | | | |

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| **Contents** | **:** | **Introduction**: Major uses of refrigeration, terms and definitions, ice refrigeration and other developments, reversed Carnot cycle.  **Vapor compression refrigeration cycle:** Ideal and actual vapor compression cycles, use of property tables, Ph/Ts- diagrams, effects of suction and condensing temperatures and pressure losses, energy and performance analyses, refrigerants, groups, chemistry and different properties, heat pumps, classifications & applications, innovative vapor compression refrigeration systems, cascade, multistage-compression, multipurpose refrigeration systems and cryogenics, domestic and commercial units.  **Vapor absorption refrigeration systems:** Cycle of operations, different solutions used in the system, terms and definitions, TPX (Poly methyl pentene), properties of different solutions, calculation of mass flow rate and enthalpy of solutions, thermal analyses, analysis with heat exchanger, domestic and commercial units, combined vapor compression and absorption system.  **Steam jet refrigeration system:** Principle of operations, representation of different processes on Mollier and Ts-diagrams, energy and performance analyses.  **Gas refrigeration:** Theoretical cycles, reversed Brayton and Stirling cycles, energy and performance analyses, modifications and applications.  **Psychrometric properties of air:** Adiabatic saturation temperature, measuring psychrometric properties,, psychrometric charts, psychrometric processes, psychrometric processes related to air conditioning equipments, and wet cooling towers.  **Air conditioning systems:** Functions of air conditioning systems, system selection, components and applications, ventilation.  **Cooling load calculations**: Heating and cooling load calculations for buildings, human body and thermal comfort, design conditions, heat gain from people, lights and appliances, heat transfer through walls, roofs, floors, and basement walls, heat transfer through windows, solar heat gain, air change load and weatherizing, cooling load calculation for refrigeration and freezing of foods, methods of freezing, product load, air change load, internal load, refrigeration equipment load, short method of load, some references from ASHRAE manuals. |

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| **Recommended Books:** | | |
|  | 1. | Dossat R.J., “Principles of refrigeration”, John Wiley & Sons, S.I., 2nd Edition, 2004. |
|  | 2. | Stoecker W.F., “Refrigeration and Air conditioning”, McGraw-Hill, 5th Edition,2000. |
|  | 3. | Jordan and Priester, “Refrigeration and Air conditioning”, John Wiley & Sons, 2nd Edition, 1985 . |
|  | 4. | Ibrahim Dincer, “Refrigeration systems & applications”, John Wiley & Sons, 2nd Edition, 2010. |
|  | 5. | Yunus A Cengel, “Heat transfer: a practical approach”, Tata McGraw hill,  4th Edition, 2011. |

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| **Approval:** | | | |
|  |  | **RESOLUTION NUMBER** | **DATED** |
|  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 |
|  | 2. | Board of Faculty Resolution No. |  |
|  | 3. | Academic Council Resolution No. | 31-07-2013 |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **MECHANICAL VIBRATIONS (ME 381)** | | | | | | | |
| **Discipline** | | | **:** | ME | | SixthSemester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Mechanics of Machines II (ME 261) | | | | | | | |
| **Co-requisite** | | | **:** | Machine Design & CAD II (ME 351) | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination. | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
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| **Aims** | **:** | To have the requisite academic background in the subject. | | | | | | | | | |
| **Objectives** | **:** | After completing this course, the student will be able:   * To determine the effects of vibration on the performance and safety of systems * To control the effects of vibration. | | | | | | | | | |

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| **Contents** | **:** | **Introduction:** Importance of the study of vibration, elementary parts of vibrating system, degree of freedom, simple harmonic motion, addition of harmonic motions, free and forced vibration.  **Systems with one degree of freedom:** Damped free vibration, root locus study of damping, logarithmic decrement, response of un-damped and damped systems under harmonic excitation, base excitation, rotating unbalance,self-excitation and stability analysis, vibration under general forcing conditions, response under periodic and non periodic forces.  **Two degree of freedom systems:** Free and forced vibration, analysis of un-damped and damped systems, normal modes, co-ordinate coupling and principal coordinates vehicle suspension systems.  **Multi degree of freedom systems:** Influence coefficient, generalized coordinates and generalized forces, Lagrange’s equation, eigen value problems.  **Numerical methods:** Dunkerley’s formula, Holzer method, vibration of continuous system, transverse vibration of a string, longitudinal vibration of a rod, torsional vibration of shaft, lateral vibration of beams, Rayleigh-Ritz method.  **Vibration control:** Methods of vibration control, whirling of shaft, vibration isolation, dynamic vibration absorber. |

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| **Recommended Books:** | | | |
|  |  | 1. Thomson, W.T., Dahleh, M.D., Padmanabhan, C., “Theory of Vibration with Application”, Dorling Kindersley (India) Pvt. Ltd., licensees of Pearson Education in South Asia, 5th Edition, 2008. |
|  |  | 1. Rao S.S., “Mechanical Vibration”, Prentice Hall, 5th Edition, 2010. |
|  |  | 1. De silva, C.W., “Vibration Fundamentals and Practice”, Taylor & Francis, 2nd Edition, 2007. |
|  |  | 1. Kelly S. G. “Fundamentals of Mechanical Vibrations”, McGraw-Hill, 2nd Edition, 2000. |

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| **Approval:** | | | |
|  |  | **RESOLUTION NUMBER** | **DATED** |
|  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 |
|  | 2. | Board of Faculty Resolution No. |  |
|  | 3. | Academic Council Resolution No. | 31-07-2013 |

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| **MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  **DEPARTMENT OF MECHANICAL ENGINEERING**   |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Title of Subject** | | | **:** | **INDUSTRIAL ECONOMICS AND MANAGEMENT (ME 401)** | | | | | | | | | **Discipline** | | | **:** | ME | | Seventh Semester | | | | | | | **Effective** | | | **:** | 14 Batch and onwards | | | | | | | | | **Pre-requisite** | | | **:** | Statistics and Probability (MTH 317) | | | | | | | | | **Co-requisite** | | | **:** | --- | | | | | | | | | **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | | | **Credit Hours** | | | **:** | 02 | + | | 00 | **Total Marks:** | 50 | + | 00 | | **Contact Hours** | | | **:** | 02 | + | | 00 | **Min. Contact hrs/semester** | 28 | + | 00 | | **Aims** | **:** | To develop the students the concept of Management & Economics, which is  very important for every engineer, so as to run the projects economically with well managed manner. | | | | | | | | | | | **Objectives** | **:** | After studying this course, the students become capable of handling and  managing the assignments more successfully during their practical life. | | | | | | | | | |  |  |  |  | | --- | --- | --- | | **Contents** | **:** | **Industry and Engineering:** Introduction to industry, choice and selection for the location of industry, general industrial setup/layout, types of production (job, batch and mass), production control, and its functions (scheduling and loading), material handling and its various types and their applications, inspection and quality control, rating techniques.  **Economics:** Basic economic concepts and principles, laws of return (scarcity and diminishing), GNP and GDP, circular flow of money,depreciation and its calculation, monetary and fiscal policy, supply and demand chain and their laws, break-even chart, margin of safety, cost and its various types (labour, material, overheads, marginal and standards costs), procurement economic ordering quantity and its method of calculation, last-in-first-out (LIFO) and first-in-first-out (FIFO) system, engineering economic analysis.  **Management:** Introduction to management,functions and responsibilities of a manager, principles of management, organization structures. |  |  |  |  | | --- | --- | --- | | **Recommended Books:** | | | |  | 1.  2.  3.  4. | Leland Blank PE, Anthony Tarquin PE, ”Basics of Engineering Economy”,  Mc Graw Hill, 1st Edition, 2008.  William G. Sullivan, C.Patrick Koelling, Elin M.Wicks, “Engineering Economy”, Prentice Hall, 15th Edition, 2011.  T.R.Banga & S.C Sharma, “ Industrial Organisation and Engg. Economics”, Khanna, 23rd Edition, 2003.  Stephen.P.Robbins and Mary Coutter (Manangment), Prentice Hall, 10th edition, 2009 | | |  |  |  |  | | --- | --- | --- | --- | | **Approval:** | | | | |  |  | **RESOLUTION NUMBER** | **DATED** | |  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 | |  | 2. | Board of Faculty Resolution No. |  | |  | 3. | Academic Council Resolution No. | 31-07-2013 | | | | | |  |  |  |
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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **AUTOMOBILE ENGINEERING (ME 411)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Seventh Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Thermodynamics II (ME 241) , Mechanics of Machines II (ME 261) | | | | | | | |
| **Co-requisite** | | | **:** | …….. | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | |
| **Credit Hours** | | | **:** | 02 | + | | 01 | **Total Marks:** | 50 | + | 50 | |
| **Contact Hours** | | | **:** | 02 | + | | 03 | **Min. Contact hrs/semester** | 28 | + | 42 | |
| **Aims** | **:** | To make students understand the fundamentals of automotive engineering. | | | | | | | | | | |
| **Objectives** | **:** | To provide knowledge about the engine components, their construction details, principles of operation and basic service procedures. In addition, students will be able to understand he processes involved in the conversion of fuel into transmission power. | | | | | | | | | | |

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| **Contents** | | | | **:** | **Engine fundamentals Engine design features:** Petrol engine, diesel engine, gas engine, two stroke and four stroke engines, single and multi-cylinder engines, cylinder blocks, engine head, engine crankshafts, firing order, hybrid and fuel cell vehicles.  **Engine construction:** Engine size, cylinder head gasket, combustion chamber, engine pistons, piston construction, piston material, piston rings and pins, engine bearings and valves, exhaust manifold, mufflers.  **Engine Ignition system:** Carburetor and EFI system, diesel fuel pump, atomizer and spark plug, pre-ignition, knocking and detonation.  **Engine Electrical Systems**: Battery, generator, self starter, ignition coil and distributer, vehicle lighting system.    **Engine cooling systems:** Cooling system pump, radiator and air fan.  **Suspension and Steering:** Front suspension and rear suspension, torsion bar, shock absorber, steering system.  **Brakes:**  Hydraulic brakes, pneumatic brakes, ABS brakes. | | | |
| **Recommended Books:** | | | | | | | | |
|  | | 1. | | | Alfered C Roth, “Small Gas Engines”, Goodheart-Willcox, 9th Edition, 2009. | | | |
|  | | 2. | | | Tim Gilles, “Engine Mechanics Diagnosis and Repair”, Cengage Learning, 2nd Edition, 2003. | | | |
|  | | 3. | | | Erich . J. Schulz, Ben L Evridge “Diesel Mechanics”, McGraw-Hill, 2nd Edition, 2008. | | | |
|  | | 4. | | | [Larry Johnson](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22Larry+Johnson%22), [William Scott Gauthier](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22William+Scott+Gauthier%22) , “Automotive Encyclopedia”, Goodheart-Willcox, 10th Edition, 2006. | | | |
| **Approval:** | | | | | | |
|  | |  | | | **RESOLUTION NUMBER** | **DATED** |
|  | | 1. | | | Board of studies Resolution No. 22.3 | 23.5.2013 |
|  | | 2. | | | Board of Faculty Resolution No. |  |
|  | | 3. | | | Academic Council Resolution No. | 31-07-2013 |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **MECHATRONICS (ME 421)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Seventh Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Instrumentation and control (ME 341) | | | | | | | |
| **Co-requisite** | | | **:** | --- | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination. | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
| **Aims** | **:** | To equip students with the multidisciplinary knowledge base necessary for developing applications involving synergistic integration of mechanical, electrical, electronic and control engineering. | | | | | | | | | |
| **Objectives** | **:** | 1. To introduce working of various sensors and actuators 2. To present key concepts regarding design of control system 3. To enable students to develop programs using Microcontroller, Programmable Logic Controller and Field Programmable Gate Arrays. 4. To teach the fundamentals of interfacing. | | | | | | | | | |
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| **Contents** | **:** | **Introduction:** Mechatronics and Mechatronic system components, Introduction to operational amplifiers, Digital logic and logic gates.  **Sensors:** Classification/types of sensors, principles of sensors, contact sensors, non-contact sensors, electromagnetic sensors, temperature sensors, touch sensors, force sensors, semiconductor strain gage, advanced tactile sensors, vision sensors, proximity sensors, limit switches, light sensors, positional and velocity sensors, optical encoders, sensors programming,  **Actuators**: Introduction, electrical actuators and their working principles, motors and types of motors. D.C motors: types, operation and speed control. stepper motors: specification and types, mechanical actuators, hydraulic and pneumatic drive systems, hydraulic pumps and hydraulic valves, mechanical switches, solenoid and relays, servo system, closed and open loop servo system, principle of operation of a servo system, definition, terms and components of servo system.  **Control system design:** Transient and steady state response, controller design and three term controller, introduction to microprocessors and microcontrollers, types of microcontrollers, microcontroller programming, introduction to programmable logic controllers and field programmable gate arrays.  **Interfacing:** Introduction to interfacing circuitry, interfacing of sensors and actuators, program control for interfacing, input and output ports, analog to digital conversion, sampling theory, digital to analog conversion, sample and hold, multiplexer, interfacing of switches, computer control system.  Software based applications in mechatronics. |

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| **Recommended Books:** | | |
|  |  | 1. David G. Alciatore, Michael B. Histland, “Introduction to Mechatronics & Measurement Systems”, McGraw Hill, 4th Edition 2011. |
|  |  | 1. W. Bolton,“Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering”, Prentice Hall, 4th Edition, 2009. |
|  |  | 1. Clarence W. De Silva,“Mechatronics An Integrated Approach”, CRC Press, 1st Edition, 2004. |

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| **Approval:** | | | |
|  |  | **RESOLUTION NUMBER** | **DATED** |
|  | 1. | Board of studies Resolution No. 20.1 | 23.5.2013 |
|  | 2. | Board of Faculty Resolution No. |  |
|  | 3. | Academic Council Resolution No. | 31-07-2013 |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **Manufacturing PROCESSES – I (ME 431)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Seventh Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Machine Design & CAD II (ME 351) | | | | | | | |
| **Co-requisite** | | | **:** | --- | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | |
| **Credit Hours** | | | **:** | 02 | + | | 01 | **Total Marks:** | 50 | + | 50 |
| **Contact Hours** | | | **:** | 02 | + | | 03 | **Min. Contact hrs/semester** | 28 | + | 42 |
| **Aims** | **:** | To introduce past and present manufacturing techniques. | | | | | | | | | |
| **Objectives** | **:** | The course introduces the concepts and practicalities of manufacturing technology, its benefits, limitations & appropriate use. The engineers/students will develop sound understanding about how to manufacture goods, using various methods and techniques. | | | | | | | | | |

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| **Contents** | **:** | **Metal casting*:*** Sand casting, making of sand molds, sand-molding machines, pattern and core making, shell-mold casting, plaster-mold casting, die casting, hot and cold chamber processes, centrifugal casting, inspection, cleaning, finishing and heat treating of castings***.***  **Metal Forming*:*** Rolling, forging, extrusion, drawing and sheet metal forming.  **Forming and Shaping of Plastics*:*** Casting, blow molding, compression molding, transfer molding, injection molding and extrusion***.***  **Joining Processes:** Welding and classification of welding processes, oxyacetylene gas welding (OAW), shielded metal arc welding (SMAW), designation system for arc welding electrode, resistance spot welding (RSW), ultrasonic welding (USW), thermite welding (TW), laser beam welding (LBW), electron beam welding (EBW), weldability and weld quality, weld design and process selection, welding of plastics, brazing, soldering and adhesive bonding.  **Abrasive machining**: Abrasives, grinding wheel balancing and dressing, honing, super finishing and lapping.  **Workholding devices**: Introduction, standard parts of a workholder, general design criteria for workholders. |

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| **Recommended Books:** | | |
|  | 1. | Paul Degarmo, “Materials and Processes in Manufacturing”,Wiley,9th Edition, 2003. |
|  | 2. | Philp F. Oswald, Jairo Munoz, “Manufacturing processes and systems”, John Wiley and sons, 9th Edition, 1998. |
|  | 3. | P.C. Sharma, S.Chand, “A Text Book of Production Engineering”, C. Chand, 10th Edition, 2008. |
|  | 4.  5. | Kalpakjian, “Manufacturing Engineering and Technology”, Addison-Wesley Publishing Company, 3rd Edition, 1999.  Serope Kalpakjian, and [Steven Schmid](http://www.amazon.com/s/ref=ntt_athr_dp_sr_2?_encoding=UTF8&field-author=Steven%20Schmid&search-alias=books&sort=relevancerank), “Manufacturing Processes for Engineering Materials” Pearson, Prentice Hill, 5th Edition, 2007 |

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| **Approval:** | | | |
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|  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 |
|  | 2. | Board of Faculty Resolution No. |  |
|  | 3. | Academic Council Resolution No. | 31-07-2013 |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **THERMAL POWER PLANTS (ME 441)** | | | | | | | |
| **Discipline** | | | **:** | ME | | SeventhSemester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Heat & Mass Transfer (ME 301) | | | | | | | |
| **Co-requisite** | | | **:** | --- | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
| **Aims** | **:** | To acquaint students with the importance of energy, effective and efficient conversion of fossil and nuclear fuels into electricity. | | | | | | | | | |
| **Objectives** | **:** | After successful completion of this course, students would be able to understand the conversion of fossil and nuclear fuels into electricity and explain the ways for energy economics and management. | | | | | | | | | |

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| **Contents** | | | **:** | **Introduction:** Energy types and classification, energy sources, energy conversion systems, energy consumption, energy, economy and environment.  **Steam Power Plant:** Fossil fuels; composition and ranking; analysis, properties; basic power cycle components and analyses, superheating and reheating of steam, regeneration, feed water heaters, optimum degree of regeneration, supercritical pressure cycle, typical layout of steam power plant, combustion equipments and firing methods for different fuels, clean-coal technologies, fluidized bed combustion, and coal gasification, environmental impact consideration, CO2 sequestration.  **Cogeneration:** Basic concepts of cogeneration, benefits, balance of energy demand, types of prime movers, micro-cogeneration units.  **Gas Turbine Power Plant:** Basic power cycle components and analyses, regeneration and modifications, site selection criterion, combustion equipment and firing methods, environmental impact consideration.  **Combined Cycle Power Plant:** Basic concepts and benefits, binary vapor cycles, combined gas-steam power plant, integrated gasification combined cycle power plant, environmental aspects.  **Diesel Engine Power Plant:** Types of diesel engine power plants, general layout, site selection criterion, and performance characteristics, environmental impact consideration.  **Nuclear Power Plant:** Nuclear fuels: fundamentals and nuclear reaction types, components of nuclear power plant, parts of a nuclear reactor, types of reactors, site selection criterion, safety operation of power plant, environmental pollution and its control.  **Power Plant Economics and Management:** Effects of variable load, terms and definitions, load curves, energy conservation and management, applications of Pinch technology, energy storage, economics of thermal power plants. | | |
| **Recommended Books:** | | | | | |
|  |  | 1. Begamudre R D, “Energy Conversion Systems”, New Age International (P) Ltd, 1st Edition, 2006. | | |
|  |  | 1. El-Wakil M.M, “Power Plant Technology”, McGraw-Hill Education, International Edition, 1985. | | |
|  |  | 1. Black & Veatch, “Power Plant Engineering”, CBS Publishers & Distributors,1st Edition, 2005. 2. Harish C. Rai, “Power Plant Engineering”, I K International Publishing House Pvt. Ltd, 2011 Edition, 2011. 3. Thomos Elliott, “Standard Hand Book of Power Plant Engineering” ,McGraw-Hill Professional , 2nd Edition, 1997. | | |
|  |  | 1. Larry Drbal, Kaylawestra, Pat Boston, “Power Plant Engineering”, CBS Publishers & Distributors, 1st Edition, 2005. | | |
|  |  | 1. Rolf Kehlhofer, et. Al, “Combined Cycle Gas and Steam Turbine Power Plants”, PennWell Corporation, 3rd Edition2009. | | |
|  |  | 1. Energy, Environment & Sustainable Development, Uqaili, M A and Harijan, K,Springer, 2012. | | |

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| **Approval:** | | | |
|  |  | **RESOLUTION NUMBER** | **DATED** |
|  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 |
|  | 2. | Board of Faculty Resolution No. |  |
|  | 3. | Academic Council Resolution No. | 31-07-2013 |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **RENEWABLE AND EMERGING ENERGY TECHNOLOGIES(ME 451)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Eighth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Thermal Power Plants (ME 441) | | | | | | | |
| **Co-requisite** | | | **:** | …… | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination. | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
| **Aims** | **:** | To acquaint the students with the renewable and emerging energy technologies. | | | | | | | | | |
| **Objectives** | **:** | After successful completion of this course, students would be able to understand various renewable energy sources and renewable and emerging energy technologies. | | | | | | | | | |

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| **Contents** | **:** | **Introduction:** Renewable energy sources, fundamentals, technical and social implications.  **Solar Energy:** Solar radiation terms and definitions, solar energy collectors, solar thermal conversion systems, storage and applications; economics and environmental aspects.    **Wind Energy:** Basic principle, Site selection, components and classification of WECS, windmills and wind turbines, performance of wind machines, storage and applications; economics and environmental aspects.  **Biomass Energy:** Biomass energy sources, conversion technologies - direct combustion; biogas generation, biogas plants: types, classification and design, biomass gasification, pyrolysis, biofuels; bioenergy storage and applications, economics and environmental aspects.  **Hydropower:** Hydrology, essential elements, classification, site selection, advantages and disadvantages; storage, economics and environmental aspects.  **Ocean Energy:** Ocean thermal energy conversion, energy from tides, components of tidal power plant, energy from ocean waves, wave energy conversion devices, site selection, advantages and limitations; ocean energy storage; economics and environmental aspects.    **Geothermal Energy:** Geothermal sources, hydrothermal resources, hot dry rock resources, magma resources, prime movers of geothermal energy conversion, geothermal energy applications; storage, economics and environmental aspects.  **Emerging Energy Technologies:** Basic physics, chemistry, and engineering of emerging energy technologies, including fuel cells, thermo-electrics, photovoltaic, batteries, hydrogen technologies. |

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| **Recommended Books:** | | |
|  | 1. | John Twidell & Tony Weir,” Renewable Energy Resources”, Taylor and Francis, 2nd Edition, 2006. |
|  | 2. | Begamudre R.D.,” Energy Conversion Systems”, New Age International (P) Ltd, 1ST Edition, 2006. |
|  | 3. | Bent Sorensen,” Renewable Energy Conversion, Transmission, and Storage”, Academic Press, 1st Edition, 2007. |
|  | 4. | El-Wakil M.M.,” Power Plant Technology”, McGraw Hill Education, International Edition,1985. |
|  | 5. | D. Yogi Goswami and Frank Kreith,” Energy Conversion”, CRC Press, Taylor and Francis Group, 2008. |
|  | 6. | Uqaili, M.A. and Harijan,K.,” Energy, Environment & Sustainable Development”, Springer, 2012 |

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| **Approval:** | | | |
|  |  | **RESOLUTION NUMBER** | **DATED** |
|  | 1. | Board of studies Resolution No. 22.3 | 23.5.2013 |
|  | 2. | Board of Faculty Resolution No. |  |
|  | 3. | Academic Council Resolution No. | 31-07-2013 |

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**

**DEPARTMENT OF MECHANICAL ENGINEERING**

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| **Title of Subject** | | | **:** | **MANUFACTURING PROCESSES – II (ME 461)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Eighth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Manufacturing Processes-I (ME 431) | | | | | | | |
| **Co-requisite** | | | **:** | ……. | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination. | | | | | | | |
| **Credit Hours** | | | **:** | 03 | + | | 01 | **Total Marks:** | 100 | + | 50 |
| **Contact Hours** | | | **:** | 03 | + | | 03 | **Min. Contact hrs/semester** | 42 | + | 42 |
| **Aims** | **:** | Toprepare individuals for professional employment in the field of mechanical and manufacturing engineering. | | | | | | | | | |
| **Objectives** | **:** | This course enables the students to select and use effectively a wide range of methods and techniques used by a broad spectrum of engineering and manufacturing companies. | | | | | | | | | |

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| Contents | : | **Theory of Material Removal Processes:** Single point tool, cutting tool geometry, mechanics of machining, chip formation and types of chips, oblique and orthogonal machining, forces, energy, power and temperature in machining, Merchant’s analysis, tool failure and tool life, Taylor’s tool life model, reconditioning of cutting tools, machinability and cutting fluids, cutting tool materials and their characteristics, determination of machining time and material removal rate for various machining operations.  **Engineering Metrology**: Measurement standards, errors in measurements line graduated instruments, comparative length measuring instruments, measuring straightness, flatness, roundness profile, coordinate measuring machines, gages, optical instruments, general characteristics and selection of measuring instruments, laser scanning and machine vision systems for measurement, standardization and interchangeability, limits and fits, standard systems of limits and fits.  **Non-Traditional Machining (NTM) Processes:** Chemical machining (CHM), electrochemical machining process (ECM), water jet machining (WJM), electrical discharge machining (EDM).  **Powder Metallurgy**: Basic process, production of metal powder, powder mixing and blending, compaction, sintering and secondary operations, advantages and limitations of powder metallurgy.  Introduction to computer integrated manufacturing (CIM).  Introduction to rapid prototyping and methods of rapid prototyping. |

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| **Recommended Books:** |

1. J T Black; R A Kohser, “Materials and Processes in Manufacturing”,John Wiley & Sons,10th Edition, 2008’
2. [Serope Kalpakjian](http://www.google.com.pk/search?tbo=p&tbm=bks&q=inauthor:%22Serope+Kalpakjian%22),”Manufacturing Engineering and Technology”,Pearson Education India, 4th Edition,2001.
3. Mikell P. Groover, “Fundamentals of Modern Manufacturing: materials, processes, and systems”,John Wiley & Sons, Inc.,5th Edition,2013.
4. John A Schey, “Introduction to Manufacturing processes”,McGraw-Hill,3rd Edition, 2002.
5. P.C. Sharma, “A Text Book of Production Engineering”, S.Chand & Company,10th Edition,2002.
6. Serope Kalpakjian, and [Steven Schmid](http://www.amazon.com/s/ref=ntt_athr_dp_sr_2?_encoding=UTF8&field-author=Steven%20Schmid&search-alias=books&sort=relevancerank), “Manufacturing Processes for Engineering Materials” Pearson, Prentice Hill, 5th Edition, 2007

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| **Title of Subject** | | | **:** | **MAINTENANCE ENGINEERING (ME 471)** | | | | | | | |
| **Discipline** | | | **:** | ME | | Eighth Semester | | | | | |
| **Effective** | | | **:** | 14 Batch and onwards | | | | | | | |
| **Pre-requisite** | | | **:** | Mechanical Vibrations (ME 381). | | | | | | | |
| **Co-requisite** | | | **:** | …… | | | | | | | |
| **Assessment** | | | **:** | 20% Sessional Work, 80% Written Examination. | | | | | | | |
| **Credit Hours** | | | **:** | 02 | + | | 00 | **Total Marks:** | 50 | + | 00 |
| **Contact Hours** | | | **:** | 02 | + | | 00 | **Min. Contact hrs/semester** | 28 | + | 00 |
| **Aims** | **:** | The main aim of imparting this subject to the students is to improve their technical background, establish a professional approach to maintenance problems, enhance general intelligence, develop mechanical aptitude and show better mean of dealing with craft personnel | | | | | | | | | |
| **Objectives** | **:** | Main objective of this subject is to improve:   * The knowledge of maintenance operation through reducing the amount of frequency of maintenance; * The effect of complexity; * Main skill required and amount of supply support; | | | | | | | | | |

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| ***Contents*** | ***:*** | **Theory and Practice of Maintenance Engineering**: Introduction, principles of organization, primary and secondary functions, manpower requirements, selection and training, policies for the operation of maintenance organization / department (work allocation, interplant relations, control, centralization and decentralization, communication and cost control) job/work order forms, maintainability management in system life cycle.  **Preventive Maintenance (PM):** How to design PM program, how to start PM program, what to inspect for PM (inspection), major benefits of PM, equipment repair history, corrosion control and industrial chemical cleaning.  **Lubrication:** Conventional tests for lubrication and major benefits of lubrications.  **Maintenance of Mechanical Equipment:** Maintenance of bearings, couplings, power transmission, gear drives, cranes, clutches and brakes.    **Maintenance of major Electrical Equipment:** Maintenance of electric motors and industrial batteries.  **Storekeeping:** Criteria for storage of parts and care during storage.  **Safety**: Emergency planning and alarm system***.*** |

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| **Recommended Books:** | | |
|  | 1. | Jeffrey A. Clade & Michael Brumbach, “Industrial Maintenance”, Thomson Delmar Learning, 2nd Edition, 2013. |
|  | 2. | B.S Dhillon, “Engineering Maintenance: A Modern Approach”, Tayler & Francis, 1st Edition, 2002. |
|  | 3. | Joel Levitt, “Complete Guide to Preventive and Predictive Maintenance”, Library of Congress, 2nd Edition, 2011. |
|  | 4. | P.E. Lindley, R. Higgin, “Maintenance Engineering Handbook”, McGraw Hill, 7th Edition, 2008. |
|  | 5. | R. Keith Mobley, “Maintenance Fundamentals (Plant Engineering Maintenance Series) “, EL series Butterworth – Heinemann, 2nd Edition, 1999. |
|  | 6. | Richard D. Palmer, “Maintenance Planning and Scheduling Handbook”, McGraw Hill, 3rd Edition, 2012. |

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| **Title of Subject** | | | | | **:** | **PROJECT MANAGEMENT (ME 481)** | | | | | | | | |
| **Discipline** | | | | | **:** | ME | | Eighth Semester | | | | | | |
| **Effective** | | | | | **:** | 14 Batch and onwards | | | | | | | | |
| **Pre-requisite** | | | | | **:** | Industrial Economics and Management (ME 401),  Health, Safety and Environment (EE 425) | | | | | | | | |
| **Co-requisite** | | | | | **:** | …. | | | | | | | | |
| **Assessment** | | | | | **:** | 20% Sessional Work, 80% Written Examination | | | | | | | | |
| **Credit Hours** | | | | | **:** | 02 | + | | 00 | **Total Marks:** | | 50 | + | 00 |
| **Contact Hours** | | | | | **:** | 02 | + | | 00 | **Min. Contact hrs/semester** | | 28 | + | 00 |
| **Aims** | | **:** | To enhance the understanding of projects and project management. | | | | | | | | | | | |
| **Objectives** | | **:** | This course will explore the dimensions and elements of project  Management, concepts, methodologies, strategies, and structures. The  course introduces students to established theories and techniques in the  field of project management. | | | | | | | | | | | |
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| **Contents** | | **:** | **Introduction:** Introduction to project and project management, need for project management, understanding the key terms related to project management.  **Project initiation phase:** Project managementobjectives, project organization, work breakdown structure (WBS)organization breakdown structure (OBS) .  **Project planning and scheduling phase:** Project planning techniques. Gantt/bar chart, network scheduling techniques, network fundamentals, graphical evaluation and review technique (GERT), precedence diagramming method (PDM), critical path method (CPM), the program evaluation and review technique (PERT), estimation techniques, estimating time and cost, resource management, optimizing the plan and compressing project duration, resource leveling.  **Project Execution:** Project executing phase, monitoring and controlling phase, closing phase, learning phase, application of computer software’s for project management. | | | | | | | | | | | |
| **Recommended Books:**   1. James P.Lewis,” Fundamentals of project Management”, Amacom, 3rd Edition, 2006. 2. Harold Kerzner Ph.D, “ Project Management, A System Approach to planning, Scheduling and controlling, Paramount, 9th Edition, 2005. 3. Teale, “ Project Risk Assessment”, Hidder & Stroughton, 2nd Edition, 2003. 4. Milton D.Rosenal & Gregony D.Githens,”Successful project Management (Practical examples)”, John Wiley & Sons, 4th Edition, 2006. 5. Gido & Clements, “ Successful Project Management”, Thomson, 2nd Edition, 2003. | | | | | | | | | | | | | | |
| **Approval:** | | | | | | | | | | | | | | |
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