Majmaah University

College of Engineering

Mechanical and Industrial Engineering

Course Description

Mechanical Measurements	
Code & No:	ME 111
Credits:	2 (1-1-2)
Pre-requisite:	GE 101
Co-requisite:	NA
Level:	4

Module Description

Measuring concepts; Uncertainty analysis; Instrumentation specifications; Analog and digital signal analysis including LabView tutorials; Data collection and analysis; Applications on measurements.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Mechanical Measurements, apply the basic terminology, concepts, principles and theories of it in order to:

- Uncertainty, Data collection and analysis, Analog and digital signal analysis, Instrumentation specifications, etc.
- Have hands on laboratory experience of the experimental and practical design aspects of important mechanical engineering concepts,
- Be able to write good technical reports.

Ability to design and conduct experiments, as well as to collect, analyze and interpret data.

The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.

The skills of good technical writing.

The analytical thinking skills.

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Theory and Design of Measurement Systems, R. S. Figliola and D.E. Beasley, John Wiley & Sons, 2006
- Lab manuals

Mechanical Eng. Drawing	
Code & No:	ME 121
Credits:	3(1-0-4)
Pre-requisite:	GE 102
Co-requisite:	NA
Level:	4

Module Description

Introduction to CAD. Skills of using a drafting package. Geometrical and dimensional tolerances. Applications on mechanical elements (bolted, welded and riveted joints, shafts and keys, springs, gears). Applications on assembly and working drawings (valves, presses etc.)

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Mechanical Eng. Drawing, apply the basic terminology, concepts, principles and theories of it in order to:

- Be able to draw mechanical elements,
- Be able to apply geometrical and dimensional tolerances,
- Practice assembly drawings,
- Be able to use drawing software packages for drawing both mechanical elements and assembly drawings.

Skills of hand drawing of sketches.

Apply knowledge of mathematics, science, and engineering
Design a system, component, or process to meet desired needs
Use the techniques, skills, and modern engineering tools necessary for engineering practice..

Textbooks and References

- "Engineering Design Graphics", James H. Earle, AutoCAD 2004, Pearson Education Inc.
- "Engineering Drawing" with a primer on AutoCAD, Archad Noor etc. Prentice-Hall 2004

Manufacturing Processes	
Code & No:	ME 212
Credits:	3(2-1-2)
Pre-requisite:	GE 101
Co-requisite:	NA
Level:	5

Module Description

Introduction, Casting processes (solidification and melting, furnaces, expendable and permanent mold casting). Bulk deformation processes (hot and cold forming processes, workability and limits of forming).Sheet metal processes (formability of sheets and sheet forming processes, processing of polymers). Metal powders and ceramics, welding processes. Heat treatment of metals, Principles of metal cutting (machining processes, types of chips, process sheet).

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Manufacturing Processes,apply the basic terminology, concepts, principles and theories of it in order to:

- Gain an understanding of different manufacturing processes, their features and areas of applications,
- Ability to compare the advantages and limitations of different manufacturing processes,
- Able to solve homework and design projects in a team environment.

Skills of hand drawing of sketches.

Outcomes

The student is expected to be able to :

Apply knowledge of mathematics, science, and engineering
Design a system, component, or process to meet desired needs
Communicate effectively
Recognize the need to engage in life-long learning
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Leo Alting, "Manufacturing Engineering Processes," Marcel-Dekker, 1993.

- M.P. Groover, "Fundamentals of Modern Manufacturing: Materials, Processes and Systems," Prentice-Hall, International, 1998.

Material Engineering	
Code & No:	ME 231
Credits:	3(2-1-2)
Pre-requisite:	GE 103
Co-requisite:	NA
Level:	5

Module Description

Classification of engineering materials, atomic and molecular bonding. Properties and microstructure, elastic and plastic behavior. Order in solids, phases and solid-solutions, crystal geometry. Disorder in solids, atomic movement and rearrangement, phase diagrams, solid-state transformations. Applications of metals, ceramics, polymers and composites.Service stability, corrosion and failure. Involves laboratory experiments and practices.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Material Engineering,apply the basic terminology, concepts, principles and theories of it in order to: Understand; Material structure, Material properties, How structure dictates properties, and How processing can change structure, Be able to use material properly, Realize new design opportunities with materials.
The experience and skills necessary to use materials for engineering practice.

Apply knowledge of mathematics, science, and engineering
Design a system, component, or process to meet desired needs

Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Materials Science and Engineering - An Introduction, W.D. Callister, 7 ed, John Wiley, 2007.
- Elements of Materials Science and Engineering, L.H. Van Vlack, Addison-Wesley Publishing Co, 1985.

Machine Dynamics	
Code & No:	ME 241
Credits:	3 (3-1-0)
Pre-requisite:	GE 104
Co-requisite:	NA
Level:	5

Module Description

Design of ordinary gear trains and analysis of epicyclical gear trains. Analytical design of disk cams. Grashof rules. Design of mechanisms in terms of transmission angle and time ratio. Kinematic and force analysis of linkages and machinery with the aid of computers. Flywheel design. Balancing. Lab work includes applications on gear trains and linkages.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Machine Dynamics,apply the basic terminology, concepts, principles and theories of it in order to: • Understand the different parts of machines (e.g. gear, cam, and flywheel) and realize; the objectives of them, how to analyze their motion and the forces on them, • Be able to design gear-train, cams, and flywheels.
Skills of hand drawing of sketches.

Apply knowledge of mathematics, science, and engineering
Design a system, component, or process to meet desired needs

Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Analysis of Mechanisms and Machinery , by M. Akyurt, KAU Center for Sci. Publ. Jeddah, 1991.
- E. Soylemez, "Mechanisms", METU Publication No.64, 1999

Thermodynamics I	
Code & No:	ME 231
Credits:	3(3-1-0)
Pre-requisite:	NA
Co-requisite:	NA

Module Description

Concepts and definitions, Properties of pure substances, Different forms of energy, Concepts of Heat and work. First law of thermodynamics. Applications of first law on closed system and control volume. Second law of thermodynamics. Entropy, isentropic efficiency. Some power and refrigeration cycles (including Rankin Cycle, vapor compression cycle, Otto cycle, Diesel cycle, Brayton cycle).

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Thermodynamics,apply the basic terminology, concepts, principles and theories of it in order to: • Properties of pure substances, Different forms of energy, and Concepts of Heat and work, • Understand the 1st, 2nd, and 3rd laws of thermodynamics, • Be able to analyze and evaluate various thermodynamic cycles used for the production of energy, heat, and work within the natural limits of conversion.

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Recognize the need to engage in life-long learning.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Fundamentals of Thermodynamics, By: Sonntag, Borgnakke and Van Wylen. John Wiley & Sons, Inc. Sixth Edition, 2003

Electrical and Electronic Circuits	
Code & No:	EE 210
Credits:	3(3-1-0)
Pre-requisite:	NA
Co-requisite:	NA
Level:	6

Module Description

Circuit elements and laws, Network theorem, Nonlinear networks-AC Circuits: Phasors, Circuit analysis, Frequency response, Resonance - Ideal Amplifiers, Ideal diodes, Rectifiers, Waveshaping circuits – Junction diodes – FETs and BJTs transistors-Logic circuits – Small signal models of Diodes, FETs, and BJTs – RC-Coupled Amplifiers.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Electrical and Electronic Circuits, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand; Electrical quantities & units, Electronic components, Circuit elements and laws, Network theorem, AC circuits, and Logic circuits.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Recognize the need to engage in life-long learning.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

- Introduction to Electrical Engineering Paul, Nasar and Unnewehr, McGraw Hill, 1992.

Machine Elements Design	
Code & No:	ME 222
Credits:	3(2-1-3)
Pre-requisite:	ME 121 + ME 232
Co-requisite:	NA
Level:	6

Module Description

Review of stress analysis (combined stress, bending). Buckling, failure theories, fatigue failure. Materials in mechanical design and safety factors. Design of fasteners: riveted, welded, bolted and fitted joints. Power screws, springs, ball bearing, sliding bearings, power transmission gears, shafts, couplings, clutches, brakes, belts, chains and ropes.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Machine Elements Design,apply the basic terminology, concepts, principles and theories of it in order to:

- Be able to analyze stresses of mechanical components under static and dynamic loads;
- Be able to design mechanical components to meet design specifications such as material selection, type of geometry, sizing and safety factor;
- Be familiar with the Codes and Standards.

Skills of hand drawing of sketches.

Apply knowledge of mathematics, science, and engineering.

Design a system, component, or process to meet desired needs

Use the techniques, skills, and modern engineering tools necessary for engineering practice.

- Mechanical Engineering Design, Shigley, Mischke, Budynas, McGraw Hill, 7th Ed, 2003,

Mechanics of Materials	
Code & No:	ME 232
Credits:	3(3-1-0)
Pre-requisite:	GE 231
Co-requisite:	NA
Level:	6

Module Description

Types of loads and stresses. Mechanical behavior of materials. Shearing forces and bending moment diagrams. Shearing stresses in beams. Stresses in compound bars. Bending stresses and deflection. Torsion of bars. Principal stresses, and Mohr's circle. 3-Dimensional stresses. Principal strains and Mohr's circles of strain. Stress-strain relations. Strain energy. Yield criteria. Thin and thick cylinders, fatigue analysis. Lab work.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Mechanics of Materials,apply the basic terminology, concepts, principles and theories of it in order to:

- Understand Load types, Deformation shapes, Stress and strain, and Material properties,
- Understand; the relations between the loads applied to a body of a given material and the resulting deformation of that body,
- Understand; the relations between the loads applied to a body and the stresses produced in that body,
- Be able to find the required dimensions of a number of specified materials to carry a given load subjected to stated specification of stress and deflection.

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- R.C. Hibbeler, "Mechanics of Materials," 7th ed, Prentice Hall, 2008.
- F.P. Beer and E.R. Johnston, "Mechanics of Materials," 5th ed, McGraw-Hill, 2006.

Mechanical Vibrations	
Code & No:	ME 242
Credits:	3(3-1-0)
Pre-requisite:	ME 241
Co-requisite:	NA
Level:	6

Module Description

Free and damped vibration of single degree of freedom systems. Viscous damping. Forced vibration. Resonance. Harmonic excitation. Rotating unbalance. Base motion. Vibration isolation. Fourier analysis. Vibration measuring. General excitation. Step and impulse response. Two degree of freedom systems. Frequencies and mode shapes. Modal analysis. Undamped vibration absorber. Multidegree of freedom systems. Matrix methods. Raleigh and Raleigh-Ritz methods. Continuous systems, axial, torsional and bending vibrations. Finite element method. Applications with computer programs.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Mechanical Vibrations, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand different types of mechanical vibration systems; (free, forced, damped, single degree, two degree, multidegree.);
- Understand resonance and harmonic excitation, and unbalanced rotation;
- Be able to measure, and analyze mechanical vibrations,
- Be able to design systems for absorbing vibrations.

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Skills required for the use of modeling and prototyping to solve different engineering problems.

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.

The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.

Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The analytical thinking skills.
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Identify, formulate, and solve engineering problems.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Singiresu Rao, Mechanical Vibrations, 4th ed, Prentice-Hall, 2004.

Thermodynamics II	
Code & No:	ME 252
Credits:	2(2-1-0)
Pre-requisite:	ME 251
Co-requisite:	NA
Level:	6

Module Description

Irreversibility and availability. Thermodynamic relations. Mixtures and solutions. Chemical reactions and combustion. Phase and Chemical equilibrium. Thermodynamics of compressible flow. Applications using computer.

Module Aims

Provide students with:

Recognition of the importance of the subject of Thermodynamics for mechanical engineering through the study of complementary chapters, with the emphasize on: • Understand; Mixtures, Solutions, Chemical reactions, Chemical equilibrium, Combustion, and Thermodynamics of compressible flow.

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The analytical thinking skills.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Recognize the need to engage in life-long learning.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- M.J. Moran and H.N. "Fundamentals of Engineering Thermodynamics," 6th ed, Shapiro, Wiley, 2007.
- T.D. Eastop and A. McConkey, "Applied Thermodynamics for Engineering Technologists," 5th ed, Prentic Hall, 1996

Fluid Mechanics	
Code & No:	ME 353
Credits:	4(3-1-2)
Pre-requisite:	ME 252
Co-requisite:	NA
Level:	7

Module Description

Concepts and definitions, Fluid statics. Forces on submerged surfaces and bodies. Non-viscous flow, conservation of mass, momentum and energy. Bernoulli equation. Dimensional analysis. The PI-Theorem, similarity. Viscous flow, pipe flow, losses in conduit flow. laminar and turbulent flow.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Fluid Mechanics, in addition to the abilty to apply the breadth and depth

of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand; Fluid characteristics and statics, Types of flow, Characteristics of flow, Force, momentum, work, and energy associated with the flow of fluids, • Be able to analyze flow of fluids, and design pipelines to meet design specifications,
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Recognize the need to engage in life-long learning.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Yunus A. Çengel and John M. Cimbala, "Fluid Mechanics, Fundamentals and Applications," 1st Ed, McGraw Hill higher Edu. 2005.

System Dynamics	
Code & No:	ME 343
Credits:	2(2-1-0)
Pre-requisite:	ME 242
Co-requisite:	NA
Level:	7

Module Description

Analytical and computer techniques for kinematic and dynamic analysis of linkages. Virtual links. Method of kinematic coefficients. Inversion. Geared linkages. Mechanisms with actuators. System response to dynamic inputs.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of System Dynamics, in addition to the abilty to apply the breadth and depth

of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand types and forms of linkages, Mechanisms with actuators. System response to dynamic inputs. • Be able to analyze linkages kinematically and dynamically.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The analytical thinking skills.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- William J. Palm III, "System Dynamics," McGraw-Hill, 2005.

Mechanical Design	
Code & No:	ME 323
Credits:	3(2-1-3)
Pre-requisite:	ME 222
Co-requisite:	NA
Level:	7

Module Description

Introduction. Design methodology (concept, alternatives, and considerations, skills of teamwork, reports, and construction and detail drawings of machines). Comprehensive design projects include: fixed and moveable joints, shafts, sliding and rolling bearings, gears, couplings, clutches and brakes, belt drivers. Use of standards and technical manuals. Application of computer programs.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Mechanical Design, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Be able to design: fixed and moveable joints, shafts, sliding and rolling bearings, gears, couplings, clutches and brakes, belt drivers, • Be able to make detail drawings of machines, • Be able to use standards and technical manuals, • Be able to use computer programs.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools for engineering practice.
Skills of hand drawing of sketches.
The analytical thinking skills.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Dieter, E. “Engineering Design”, 3rd edition, McGraw-Hill, 2000.
- Shigley J.E. and Mischke C.R. “Mechanical Engineering Design”,7th Edition, McGraw-Hill, 2001
- Software manuals.
- Vendor catalogues.
- DIN Standards and Design codes.
- Handouts from Roloff / Matek “Maschinen-elemente”, Vieweg & Sohn Verlag, 2003

Electrical Machines	
Code & No:	EE 398
Credits:	2 (2-1-0)
Pre-requisite:	EE 210
Co-requisite:	NA
Level:	7

Module Description

Transformers (construction, types, operation, equivalent circuit); Synchronous machines (construction, generator performance, motor characteristics, starting); induction machines (construction, three phase motor: types, operation, equivalent circuit, starting speed control); Introduction to DC machines.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Electrical Machines, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand the construction, types, characteristics, and operation of: Transformers; Synchronous machines; induction machines, and DC machines.

The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Fundamentals of Electric Machinery,Chapman, McGraw Hill, 1995

Heat Transfer

Code & No:	ME 354
Credits:	3(3-1-0)
Pre-requisite:	ME 353
Co-requisite:	NA
Level:	8

Module Description

Principles of Heat Transfer, steady state and transient conduction in different co-ordinates, extended surfaces. Convective heat transfer. Analysis and empirical relations for forced and natural convection. Radiation heat transfer, radiation exchange between black and gray surfaces. Heat transfer applications (Heat Exchangers). Numerical methods in heat transfer with computer applications.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Heat Transfer, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand: Steady state, Conduction heat transfer, Convective heat transfer, and Radiation heat transfer,
- Be familiar with different applications of heat transfer,
- Be able to use numerical methods for solving heat transfer problems with the help of computer applications.

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications.

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Recognize the need to engage in life-long learning.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Incropera and De Witt, "Fundamentals of heat and mass transfer," 6th edition, 2007 .

Automatic Control	
Code & No:	ME 344
Credits:	2(2-1-0)
Pre-requisite:	ME 343 – ME 353
Co-requisite:	NA
Level:	8

Module Description

Introduction. Laplace transforms. Transfer function. Block diagrams. Mathematical modeling of dynamic systems Industrial automatic controllers: basic control actions. Pneumatic and hydraulic controllers. Transient response analysis: First and second order systems. Root locus analysis. Frequency response. Application of computer programs

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Automatic Control, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand: Block diagrams, State space equations of control systems, and Transfer function,
- Be able to construct Mathematical modeling of dynamic systems: (Mechanical, electrical, electro-mechanical, liquid-level, thermal and pressure systems),
- Become familiar with types of industrial automatic controllers,

Skills required for the use of mathematical modeling in solving various engineering problems.

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.

The analytical thinking skills.

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- K. Ogata, "Modern Control Engineering," 4th, Edition, Prentice Hall, 2002.

Refrigeration & Air conditioning	
Code & No:	ME 355
Credits:	3(2-1-2)
Pre-requisite:	NA
Co-requisite:	ME 354
Level:	8

Module Description

Review of basic thermodynamics, vapor compression cycles, multi-stage and cascade vapor compression refrigeration. Refrigerants and their characteristics. Basic vapor compression equipment, Introduction to absorption refrigeration. Psychrometry and psychrometric processes. Human comfort. Heat gain-through walls and fenestrations. Cooling load calculations. Calculation using software packages.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Refrigeration and Air conditioning, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Recognize the different methods of refrigeration e.g. Vapor compression and Absorption refrigeration
- Understand refrigeration cycles, refrigerants and their characteristics, and vapor compression equipment,
- Be able to carry out necessary calculations concerning RAC e.g. Cooling load,

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.

The analytical thinking skills.

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Heating Ventilating and Air conditioning, Mcquiston, Parker and Spitler, John Wiley & Sons, 2005

Turbulent flow	
Code & No:	ME 356
Credits:	3(3-1-0)
Pre-requisite:	ME 353
Co-requisite:	NA
Level:	8

Module Description

Fundamentals of turbulent flows; the basic equations and the characteristic scales, statistical description of turbulence. Review of experimental results on the statistics and structure of turbulent flows. Methods for calculation of turbulent flows; the problem of closure, semi-empirical, phenomenological and analytical theories of turbulence, large eddy and direct simulations of turbulence.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Turbulent Flows, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand and be able to use statistical description of turbulence,
- Understand phenomenological and analytical theories of turbulence,
- Be able to carry out necessary calculations concerning turbulent flows,

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- An Introduction to Turbulent Flow, Jean Mathieu, Julian Scott, Cambridge University Press (June 26, 2000)

Membrane desalination processes	
Code & No:	ME 357
Credits:	2 (2-1-0)
Pre-requisite:	NA
Co-requisite:	ME 354
Level:	8

Module Description

Intake, pumping, Filtration, ion exchange, pretreatment, Membranes, Membrane technology, Reverse Osmosis systems (RO) principles, system design, RO membranes characteristics. Electrodialysis (ED), Other membrane processes, introduction to fouling, Computer applications

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Membrane Desalination Processes, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand types of desalinations processes, system operation, and membrane technology,
- Become familiar with different membrane processes and equipments,
- Be able to design a membrane system, and carrying out all necessary calculations,

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Engineering Systems for Desalination, M.A. Darwish, A. El-Sayed, M. El-Sayed, S.E. Aly, King AbduAlaziz Univ, 1995
- Fundamentals of Water Desalination, E.D. Howe, Marcel Dekker

Turbo Machines	
Code & No:	ME 458
Credits:	3(3-1-0)
Pre-requisite:	ME 356
Co-requisite:	NA
Level:	9

Module Description

Fluid mechanics and energy transfer in turbo – machines, Centrifugal and axial compressors. Centrifugal and axial flow turbines. Applications, including industrial gas turbine engines and aircraft engines.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Turbo Machines, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand fluid mechanics and energy transfer in turbo machines,
- Understand working principles of centrifugal and axial compressors and turbines,
- Become familiar with the different applications of turbines.
- Be able to carry out necessary calculations,

Apply knowledge of mathematics, science, and engineering.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Fluid Mechanics and Thermodynamics of Turbo machinery, S.L. Dixon, Pergamon Press
- Gas Turbine Theory, Saravanamuttoo, G. Rogers, H. Cohen, Prentice Hall, 2001

Internal Combustion Engines	
Code & No:	ME 459
Credits:	3(3-1-0)
Pre-requisite:	ME 252
Co-requisite:	NA
Level:	9

Module Description

Spark ignition and compression ignition engine types, design and operating parameters; thermo chemistry of fuel-air mixture and thermodynamic models of working fluids and engine cycles. Gas exchange processes and volumetric efficiency. Carburetors and electronic fuel injection. Performance parameters. Combustion chamber design, and octane number. Diesel fuel injection, supercharging of 4-stroke and 2-stroke S.I. and C.I. engines.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Internal Combustion Engines, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand different types of ignition engines, and its working cycles,
- Understand design and operating parameters of engines and combustion chamber;
- Understand thermo chemistry of fuel-air mixture, and working of carburetors and electronic fuel injection systems,
- Be able to use performance parameters,

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Fundamentals of Internal Combustion Engines, J. B. Heywood, McGraw-Hill, 1988

Mechanical Power Lab. (I)	
Code & No:	ME 493
Credits:	1(0-0-2)
Pre-requisite:	ME 111
Co-requisite:	NA
Level:	9

Module Description

The design, execution, and evaluation of physical experiments in the area of fluid mechanics, thermodynamics, heat transfer, and air conditioning. Digital simulation of linear systems using a software package (MATLAB). Emphasis on the application of classroom theory to experimental engineering and interpretation and presentation of results.

Module Aims

Provide students with:

- Gain an understanding regarding carrying out lab experements in areas of fluid mechanics, thermodynamics, heat transfer, and air conditioning.
- Show ability for data collection and analysis, Analog and digital signal analysis, Instrumentation specifications, etc.
- Have hands on laboratory experience of the experimental and practical design aspects of important mechanical engineering concepts
- Be able to apply digital simulation of linear systems using a software package (MATLAB)
- Be able to write good technical reports

Ability to design and conduct experiments, as well as to collect, analyze and interpret data.

The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.

Skills of hand drawing of sketches.

The skills of good technical writing.

The analytical thinking skills.

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.

Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Theory and Design of Measurement Systems, R. S. Figliola and D.E. Beasley, John Wiley & Sons, 2006
- Lab manuals

Senior Design I	
Code & No:	ME 498
Credits:	2(1-0-2)
Pre-requisite:	NA
Co-requisite:	NA
Level:	9

Module Description

Choosing the topic, establishing the project, literature review, preparing for/or preliminary conducting the experiments, collecting the field data & developing the mathematical/ computer model if applicable, writing the first two chapters along with any preliminary findings.

Module Aims

Provide students with:

The experience necessary to apply the scientific background he have gained from different courses in dealing with an engineering problem from all points of view (Choosing the topic, establishing the project, literature review, preparing for/or preliminary conducting the experiments, collecting the field data & developing the mathematical/ computer model if applicable, writing the first two chapters along with any preliminary findings)
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications.
Skills required for the use of modeling and prototyping to solve different engineering problems.
Skills required for the use of mathematical modeling in solving various engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.

Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work.
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
The skills necessary to demonstrate cooperative planning and problem solving.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Design a system, component, or process to meet desired needs.
Function on multi-disciplinary teams.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- NA

Power Plants	
Code & No:	ME 460
Credits:	3(3-1-0)

Pre-requisite:	ME 354
Co-requisite:	NA
Level:	10

Module Description

Energy demand and power generation systems. Steam and gas power cycles. Fuels and combustion. Basic and auxiliary systems of a steam p.p. Steam generator analysis. Steam turbines and their controls. Diesel engine and gas turbine power plants. Overall plant performance. Economics of power plants.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Power Plants, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand different power generation systems, and steam and gas power cycles.
- Understand basic and auxiliary systems of steam power plant,
- Be able to analyze the performance of the different parts of the power plant as well as the overall performance of the plant, and recognize the economics of power plants.

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Power Plant Engineering, P.K.Nag, McGraw Hill, 1998

Mechanical Power Lab. (2)	
Code & No:	ME 494

Credits:	1 (0-0-2)
Pre-requisite:	ME 493
Co-requisite:	NA
Level:	10

Module Description

Continue the course of Mechanical Power Lab (I) concerning the design, execution, and evaluation of physical experiments in the area of fluid mechanics, thermodynamics, heat transfer, and air conditioning. Digital simulation of linear systems using a software package (MATLAB). Emphasis on the application of classroom theory to experimental engineering and interpretation and presentation of results.

Module Aims

Provide students with:

- Gain an understanding regarding carrying out lab experements in areas of fluid mechanics, thermodynamics, heat transfer, and air conditioning.
- Show ability for data collection and analysis, Analog and digital signal analysis, Instrumentation specifications, etc.
- Have hands on laboratory experience of the experimental and practical design aspects of important mechanical engineering concepts
- Be able to apply digital simulation of linear systems using a software package (MATLAB)
- Be able to write good technical reports

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of mathematical modeling in solving various engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work.

The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Theory and Design of Measurement Systems, R. S. Figliola and D.E. Beasley, John Wiley & Sons, 2006
- Lab manuals

Senior Design II	
Code & No:	ME 499
Credits:	2(1-0-2)
Pre-requisite:	ME 498
Co-requisite:	NA
Level:	10

Module Description

Continuation of Part-I of the project including: running and finalizing the experimental program or the mathematical/computer model, analyzing the results and findings and drawing the conclusion, writing the complete project report, presenting and defending the project.

Module Aims

Provide students with:

The ability to continue Part-I of the project including: running and finalizing the experimental program or the mathematical/computer model, analyzing the results and findings and drawing the conclusion, writing the complete project report, presenting and defending the project.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.
Skills required for the use of mathematical modeling in solving various engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
The skills necessary to demonstrate cooperative planning and problem solving.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Design a system, component, or process to meet desired needs.
Function on multi-disciplinary teams.

Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- NA

Applied fluid mechanics	
Code & No:	ME 461
Credits:	3(3-1-0)
Pre-requisite:	ME 353
Co-requisite:	NA
Level:	9

Module Description

Differential forms of the governing equations for fluid flow. Inviscous flow, compressible flow, boundary layer flow. Flow machines, Flow in pipe networks with applications using computer codes.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Applied fluid mechanics, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Gain an understanding and ability of using differential forms of the governing equations for different types of fluid flow.

Apply knowledge of mathematics, science, and engineering.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Applied Fluid Mechanics, Robert L. Mott, Prentice Hall; 6 edition (July 23, 2005)

Biofluid Mechanics	
Code & No:	ME 462
Credits:	3(3-1-0)
Pre-requisite:	ME 353
Co-requisite:	NA
Level:	9

Module Description

Introduction to thermodynamics: Concepts of heat and work, specific heat and enthalpy, Fluid statics and hydrostatic pressure. Viscous and non-viscous, laminar and turbulent flows, Circulatory biofluid mechanics, Properties of flowing blood, Models of biofluid flows, non-Newtonian fluids. Heat generation by metabolism, modeling of heat transfer in human bodies

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Biofluid mechanics, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand properties of flowing blood, circulatory biofluid mechanics, and generation of heat by metabolism,
- Be able to apply make mathematical modeling of heat transfer in human bodies

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Biofluid Mechanics: The Human Circulation, Krishnan B. Chandran, Alit P. Yoganathan, Ajit P. Yoganathan, Stanley E. Rittgers, CRC Press; 1 edition, 2006

Gas dynamics	
Code & No:	ME 463

Credits:	3(3-1-0)
Pre-requisite:	ME 252
Co-requisite:	NA
Level:	9

Module Description

Introdution to the frictionless compressible flow. Internal flow with friction and heat transfer. Acoustics and wave motion. Oblique shocks and expansion waves. Two-dimensional subsonic and supersonic flow including hodograph transformations, linearized theory of thin airfoils, and the method of characteristics. Introduction to transonic and hypersonic flow and reentry problems.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Gas dynamics, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand the characteristics of compressible flow with and without friction,
- Understand the characteristics of two-dimensional subsonic and supersonic flow,
- Understand the characteristics of transonic and hypersonic flow,
- Understand the linearized theory of thin airfoils, and the method of characterization.

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Munson, Young, and Okiishi - Fundamentals of Fluid Mechanics, Wiley 5th edition

Desalination Plants	
Code & No:	ME 464
Credits:	3(3-1-0)

Pre-requisite:	ME 357
Co-requisite:	NA
Level:	10

Module Description

Comparison of different desalination systems. Development of desalination processes, characteristics of varies systems. System design and selection, intake and disposal, water pretreatment, post treatment processes, corrosion and material selection. Desalination system economy.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Desalination Plants, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand different desalination systems, and the characteristics and advantages of each system,
- Understand desalination system design and selection,
- Be able to analyze desalination system economy.

Apply knowledge of mathematics, science, and engineering.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Engineering Systems for Desalination, M.A. Darwish, A. El-Sayed, M. El-Sayed, S.E. Aly, King AbduAlaziz Univ, 1995
- Fundamentals of Water Desalination, E.D. Howe, Marcel Dekker

Energy Conversion	
Code & No:	ME 465
Credits:	3(3-1-0)
Pre-requisite:	ME 354
Co-requisite:	NA
Level:	10

Module Description

Review of indirect energy conversion systems, (ICE, gas turbine engines, steam pp): energy storage; thermoelectric; photovoltaic; magneto hydrodynamic gen.; fuel cells; other energy conversion systems.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Energy Conversion, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand different systems of energy generation, energy conversion and energy storage,

Apply knowledge of mathematics, science, and engineering.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Energy conversion, Kenneth C. Weston (ebook), 1992
- Powerplant Technology, M. M. El-Wakil, (ISBN 4-287102-07-0)

Renewable Energy	
Code & No:	ME 466
Credits:	3(3-1-0)
Pre-requisite:	ME 354
Co-requisite:	NA
Level:	10

Module Description

Review of heat transfer, solar angles, and solar radiation on earth's surface. Solar radiation on tilted surfaces. Radiation measurements. Solar collectors and concentrators, storage, photovoltaic, wind energy, geothermal energy. Other renewable energy sources.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Renewable Energy, in addition to the abilty to apply the breadth and

depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand nature, and characteristics of solar radiation (solar angles, solar radiation on earth's surface, solar radiation on tilted surfaces, solar collectors and concentrators, storage),
- Understand other renewable energy sources (wind energy, geothermal energy.)

Apply knowledge of mathematics, science, and engineering.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Renewable Energy, Godfrey Boyle, Oxford University Press, USA; 2nd edition, 2004

Ventilation and Air Conditioning Systems	
Code & No:	ME 467
Credits:	3(3-1-0)
Pre-requisite:	ME 355
Co-requisite:	NA
Level:	10

Module Description

Cascade V.C. cycle, Gaseous air refrigeration cycles. Absorption refrigeration systems. Thermoelectric cooling. Cold storage and applications. Refrigeration control systems, Air distribution systems (duct design).Air conditioning systems and their representation on psychometric chart. Air conditioning control. Air conditioning equipment

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Ventilation and Air Conditioning Systems, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand thermoelectric cooling, cold storage, and cold storage application,

• Gain a deep understanding of air conditioning and air distribution systems as well as air conditioning control, and air conditioning equipment.

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Heating Ventilating and Air conditioning, Mcquiston, Parker and Spitler, John Wiley & Sons, 2005
- Heating, Ventilating, and Air Conditioning: Analysis and Design, F.C. McQuiston and J.d. Parker; John Wiley & Sons

Applied Heat Transfer	
Code & No:	ME 468
Credits:	3(3-1-0)
Pre-requisite:	ME 354
Co-requisite:	NA
Level:	10

Module Description

Classification of Heat Exchangers, Design Correlations and Fouling, Basic Thermal Design Methods and Iterative Techniques, types of heat exchanger:Double-Pipe Heat Exchangers, Shell-and-tube Heat Exchangers, Compact Heat Exchangers, Other Heat Exchangers, Correlations for Two-Phase Flow, Condensers and Evaporators

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Applied Heat Transfer, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Be familiar with different types of Heat Exchangers, and be able to select the heat exchanger most suitable for a particular application,

• Understand basic thermal design methods and iterative techniques, and be able to apply them, • Understand work principles of Condensers and Evaporators
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The analytical thinking skills.
The skills necessary to demonstrate cooperative planning and problem solving.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Fundamentals of Heat and Mass Transfer, Incropera F. P. and Dewitt D. P. John Wiley & Sons, 2002

Modeling & simulation of thermal systems	
Code & No:	ME 469
Credits:	3(3-1-0)
Pre-requisite:	ME 354
Co-requisite:	NA
Level:	10

Module Description

Basic considerations and types of modeling, Numerical modeling and simulation of thermal systems, Optimization and search techniques, Examples and applications using computer.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Modeling & simulation of thermal systems, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand types of modeling, and its advantages, • Be able to apply modeling and simulation techniques for thermal systems, • Become familiar with available software packages for modeling and simulation for thermal systems.
Skills required for the use of mathematical modeling in solving various engineering problems.
The analytical thinking skills.

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Design a system, component, or process to meet desired needs.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Design and Optimization of Thermal Systems, Yogesh Jaluria, Taylor & Francis, Inc. 2007

Majmaah University

College of Engineering

Industrial Engineering

Course Description

Industrial Operations Research I	
Code & No:	ME 371
Credits:	3(3-1-0)
Pre-requisite:	Math 107
Co-requisite:	NA
Level:	8

Module Description

Introduction to Operations Research. Formulation of linear programming problems. Graphical solution. The Simplex algorithm. Duality and sensitivity analysis. Transportation and assignment problems. Integer and Goal programming.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Operations Research, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Be able to mathematically formulate different engineering problems, solve linear problems, and perform sensitivity analysis,
- Understand the term "heuristic solutions" and show ability to use them in solving network problems (transportation, assignment, max. flow,. etc)
- Be able to formulate and solve problems with interger variables using Integer-programming.
- Be able to use Goal-programming

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Skills required for the use of modeling and prototyping to solve different engineering problems.

Skills required for the use of mathematical modeling in solving various engineering problems.

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.

The analytical thinking skills.

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Operations Research, Hamdy A. Taha, 6th Ed. Prentice Hall.
- Operations Research, Deterministic Optimization Models, Katta G. Murty, Prentice Hall, 1995.

Quality Management	
Code & No:	ME 372
Credits:	3(3-1-0)
Pre-requisite:	STAT 101
Co-requisite:	NA
Level:	8

Module Description

Introduction to quality systems. Cost of quality. Total quality management. Quality systems and standards: six sigma and ISO. Reengineering. Statistical quality control: control charts for variables and attributes, process capability analysis, acceptance sampling plans. Quality function deployment. Quality circles. Quality loss functions.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Quality Management, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Gain knowledge of: Basic elements of a Quality Management System (QMS); International standards such as ISO 9000 and ISO 14001; Six Sigma; Structuring QMS; documentation; Strategic and competitive issues in QMS; Quality auditing and management reviews;

• Become able to apply basic methods of statistical process control (SPC) as problem solving tools and methods for process capability analysis and statistical inferences • Understand different quality improvement tools (Quality function deployment. Quality circles. Quality loss functions).
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

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Outcomes

Apply knowledge of mathematics, science, and engineering.
Function on multi-disciplinary teams.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Introduction to Statistical Quality Control, Douglas C. Montgomery, John Wiley & Sons, 2001
- Quality Planning & Analysis, J. M, Juran & F. M. Gryna, Mc GRAW-HILL International Editions, 1993

Reliability & Maintenance Engineering

Code & No:	ME 373
Credits:	2 (2-1-0)
Pre-requisite:	ME 101
Co-requisite:	NA
Level:	8

Module Description

Maintenance systems. Maintenance operation and control. Preventive Maintenance: concepts, modeling, and analysis. Maintenance planning and scheduling. Maintenance material control. Computerized Maintenance Management Systems. Replacement studies. Case studies.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Reliability & Maintenance Engineering, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: Understand types of maintenance plans, and features of good and effective maintenance planning and control system, Be able to schedule maintenance work with the consideration of planning and control for maintenance material, Be aware of Computerized Maintenance Management Systems. Be able to carry out replacement studies.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools for engineering practice.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work.
The skills necessary to demonstrate cooperative planning and problem solving.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Function on multi-disciplinary teams.

Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Planning & Control of Maintenance Systems, Modeling and Analysis, Duffuaa, S O, Raouf, A & Campbell, J D, John Wiley & Sons, New York, 1999
- Strategies for Excellence in Maintenance Management, Campbell, J D, Productivity Press, Portlan, 1995

Industrial Operations Research II	
Code & No:	ME 474
Credits:	3 (3-1-0)
Pre-requisite:	ME 371
Co-requisite:	NA
Level:	9

Module Description

Non-linear programming. Dynamic programming. Inventory models. Waiting line models. Markov analysis. Introduction to Game theory. Applications in industrial, service and public systems.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Stochastic Operations Research Models, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: Extend the background in modeling and solving real-world industrial engineering problems. Comprehend: the Nonlinear programming and its applications, the dynamic programming and its applications, To present an applied treatment of modelling, analysis and solution of probabilistic operations research problems: Inventory models, Markov analysis, Waiting line models and queuing theory Understand Game Theory and its applications
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.

Skills required for the use of mathematical modeling in solving various engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The analytical thinking skills.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.
Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Introduction to Operations Research, Hillier and Lieberman, McGraw Hill, Singapore, 7e, 2001
- Operations Research: An Introduction, Hamdy A. Taha, Pearson Education, Singapore, 7e, 2002

Computer Aided Design & Manufacturing	
Code & No:	ME 475
Credits:	3 (2-1-2)
Pre-requisite:	ME 212 – ME 323
Co-requisite:	NA
Level:	9

Module Description

Introduction to CAD/CAM; Computer technology and CAD/CAM software and hardware; Geometric modeling and its approaches; Geometric transformations; Viewing in 3D; Numerical control; Types of numerical control; Numerical control programming.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Computer Aided Design & Manufacturing, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: Understand basic concepts of Computer Numerical Control (CNC) machines Develop/compute the process plan of simple components (drawing, write the part program, and execute it on a model CNC machine,

Explain/use the working principles of different types of Robots and be able to write programs for them. Explain the methods of Group Technology (GT) and develop some ability to design machine cells based on GT. Explain the basic principles of CAPP and how CIMS work. Explain the working principles of Flexible Manufacturing System (FMS)
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
The skills of good technical writing.
The analytical thinking skills.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Design a system, component, or process to meet desired needs.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Mikell P. Groover, and Emory W. Zimmers, Jr.: "CAD/CAM: Computer-Aided Design and Manufacturing", Prentice Hall, Inc. 1990.

Work Study Lab

Code & No:	ME 495
Credits:	1 (0-0-2)
Pre-requisite:	ME 111
Co-requisite:	NA
Level:	9

Module Description

Introduction to Work Study (WS). Productivity and WS. WS approaches. Basic procedure of method study involving job selection, recording facts, critical examination etc. String diagram, Multiple activity chart, Travel chart. Principles of motion economy. Two-handed chart. Fundamental hand motions. Micro-motion and Memo-motion studies. Cyclegraph and Chrono-cyclegraph. Work Measurement (WM). Work sampling. Time study. Computerized WM. PMTS: MTM, Work factor and Standard data. Wage payment and incentive plans.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Work Analysis and Design, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Be able to analyze and evaluate the productivity of people and machines in manual and semi-automated environment.
- Be able to use the tools and techniques of method study (Charts/diagrams)
- Be able to use the tools and techniques of work measurement
- Be able to design, perform and analyze the studies/experiments related to WS (e. g. process analysis, operation analysis, time study, Pre-determined motion time system, Standard data and work sampling).

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Skills required for the use of modeling and prototyping to solve different engineering problems.

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.

Ability to design and conduct experiments, as well as to collect, analyze and interpret data.

The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.

The skills of good technical writing.

The analytical thinking skills.

Ability for team work.

The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Design a system, component, or process to meet desired needs.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Introduction to Work Study, International Labor Office:Geneva, 4th Revised edition, 1992
- Work measurement and Methods Improvement, Lawrence, SA, John Wiley & Sons
- Motion and Time Study: Design & Measurement of Work, Barnes, RM, John Wiley & Sons, 2000
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Industrial Operations Management	
Code & No:	ME 476
Credits:	3(3-1-0)
Pre-requisite:	MATH 107
Co-requisite:	NA
Level:	10

Module Description

Basic concepts of Production and Operations Management (POM). Design of products and services. Processes and technologies, Inventory management. Forecasting. Material Requirements Planning (MRP). Scheduling. Supply-Chain management. Just-in-time and lean productionIntroduction to Enterprise Requirement Planning (ERP). Capacity and Aggregate planning.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Industrial Operations Management, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand the overall decision making process associated with the field, be able to apply decision making techniques and to understand the strategic implications of decision regarding product, process and site location, • Be able to: forecast demand, apply aggregate planning and master production scheduling techniques, apply basic inventory control, material requirements planning and scheduling models in an operations environment, • To be able to understand the difference between supply chain management and traditional purchasing,
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The analytical thinking skills.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Operations Management, Heizer J. and Render B. Pearson Prentice Hall, 8e, 2007
- Operations Management, Russell R. Taylor III, B.W. Pearson Prentice Hall, 4e, 2003

Human Factors Engineering Lab	
Code & No:	ME 496
Credits:	1 (0-0-2)
Pre-requisite:	ME 495
Co-requisite:	NA
Level:	10

Module Description

Introduction to human factors engineering. Muscular work. Nervous control. Work efficiency. Body size and anthropometrics. Work station design. Heavy work. Handling loads. Man-machine systems. Mental activity. Fatigue. Stress and boredom. Vision and lighting. Noise and vibration.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Human Factors Engineering, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand how people fit into technological systems
- Recognize the limits of human perceptual-motor capabilities.
- Recognize the limits of human cognitive functioning and why people make errors.
- Recognize the human indicators of fatigue and stress.
- Be able to write reports that describe human performance.
- Be able to assess workstation and task design for ergonomic deficiencies. And appreciate the importance of organization and job design factors for performance and satisfaction.
- Be able to define safety hazards and general approaches for their control.

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.

The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.

Ability to design and conduct experiments, as well as to collect, analyze and interpret data.

The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.

The skills of good technical writing.

The analytical thinking skills.
Ability for team work.
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
The skills necessary to demonstrate cooperative planning and problem solving.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Function on multi-disciplinary teams.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Fitting the Task to the Human: A Text Book of Occupational Ergonomics, Kroemer, KHE & Grandjean, E. Taylor & Francis Publishers, London, 5e, 1997
- Occupational Ergonomics, Principles & Applications, Tayyari, F & Smith, J, Chapman & Hall: London, 1997

Engineering Design	
Code & No:	ME 477
Credits:	3 (3-1-0)
Pre-requisite:	ME 306
Co-requisite:	NA
Level:	9

Module Description

Engineering design process. Computer modeling and heuristics for solving problems, in teams, in the areas of comparison of strategies, trade-offs, decision making, stochastic processes, optimization and expert systems. Interpretation of results. Preparation of professional technical reports of engineering work and multimedia presentation.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Engineering Design, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Be able to identify the most relevant needs (objectives) from an open ended problem. • Be able to breakdown an open ended problem into its main elements (variables, constraints, parameters, etc.) • Be able to develop alternative models by using basic mathematical, scientific and engineering knowledge. • Be able to choose the best model. • Be able to solve the model by a suitable computer software/tool. • Be able to test the model and analyze the results to determine if they are sufficient. • Be able to evaluate the solution and argue suitable improvements and changes.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- How To Model It, Problem Solving for the Computer Age, Anthony M. Starfield, Karl A. Smith, and Andrew L. Bleloch, McGraw-Hill, 1994

Industrial Management	
Code & No:	ME 478
Credits:	3 (3-1-0)
Pre-requisite:	ME 306
Co-requisite:	NA
Level:	9

Module Description

Introduction to industrial management. Economic concepts in industry. Organizational structure and design. Human resource management. Motivating the work force. Managing information technology. Financial management. Engineers in marketing and services. Job analysis, job description, and job specification. Preparation of business plan.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Industrial Management, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- To be able to comprehend management function in industry (Planning, Organizing, staffing, and Control.).
- Understand Organizational structure and design.
- Understand Human resource management tasks: Job analysis, Job description, Job specification, Preparation of business plan, Motivation of work force,

• Understand concepts of: information technology management, and financial management. • Recognize economic concepts in industry.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
The skills of good technical writing.
The analytical thinking skills.
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Excellence in Business, Edition 3rd, Bovee. Thill. Mescon, Prentice Hall.
- Business A Changing World, 5/e: Ferrel Hirt Ferrel, McGraw-Hill 2006.
- Contemporary Business, Louis E Boone, David L Kurtz, Thomson South-Western.

Manufacturing Economics	
Code & No:	ME 479
Credits:	3 (3-1-0)
Pre-requisite:	MATH 204
Co-requisite:	NA
Level:	9

Module Description

Basic accounting concepts; Cash flow and financial statements analysis; Standard costs and variance analysis; Cost analysis and operation decisions; introduction to cost reduction programs.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Manufacturing Economics, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand cost terms, the concepts of cost analysis, and management accounting. • Be able to calculate and apply Cost-Volume-Profit Analysis • Be able to make decisions by Measuring relevant cost and revenues. • Be able to calculate and explain the cost assignment. • Be able to compute and explain Activity based costing • Be able to use the techniques, skills, and modern engineering tools necessary for cost decision practices
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The skills of good technical writing.
The analytical thinking skills.
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.

Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Financial and Cost Analysis for Engineering and Technological, Management, H. Riggs, Wiley & Sons.

Industrial Information Systems	
Code & No:	ME 480
Credits:	3 (3-1-0)
Pre-requisite:	NA
Co-requisite:	NA
Level:	9

Module Description

General concepts. Values and attributes of information. Different types of information systems. Concepts of managerial information systems. Emphasis on analysis, design, and development of industrial information systems. Developing information systems by using microcomputers.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Industrial Information Systems, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand the different types of information systems. • Be able to: design, develop, and analyze industrial information systems. • Be able to develope information systems by using microcomputers. • Identify ethical implications of Information Systems.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The analytical thinking skills.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Understand professional and ethical responsibility.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Information Systems in Business: An Introduction, James O. Hick,West Publishing Co.

Safety Engineering	
Code & No:	ME 481
Credits:	3 (3-1-0)
Pre-requisite:	GE 101
Co-requisite:	NA
Level:	9

Module Description

Accident: causes and costs. Appraising safety performance and risk assessment. Analysis of accident causes. Accident reports and records. Job safety analysis. Plant inspection. Accident investigation. Plant layout and arrangement. Plant housekeeping. Maintenance and safety. Material handling and safety. Machine guarding. Explosion and fire prevention. Personal protection. First aid. Planning for emergencies.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Safety Engineering, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand different forms of occupational hazards.
- Be able to apply analytical tools to define occupational hazards.
- Be able to apply intervention strategies for ameliorating occupational hazards.
- know where to find information resources regarding occupational hazards.

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Industrial Safety and Health Management, C. Ray Asfahl, Prentice Hall, 1998.
- Safety, Health, and Environmental Protection, Charles, A. Wwntz, McGraw-Hill, 1998.

Industrial Systems Simulation	
Code & No:	ME 482
Credits:	3 (2-1-2)
Pre-requisite:	ME 474
Co-requisite:	NA
Level:	10

Module Description

Basic theory of industrial simulation. Building simulation models. Organization of simulation studies. Simulation modeling and application to medium and large-scale production and service system problems. Output analysis. Variance reduction and optimization. Use of software such as ARENA for discrete and continuous system simulation.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Industrial Systems Simulation, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand the major capabilities and limitations of discrete-event simulation for modeling types of systems that industrial engineers commonly encounter. • Be able to build and run simple discrete-event simulation models in practical situations. • Understand the main assumptions underlying these models, and what can happen when these assumptions do not hold. • Be able to use simulation software tools to model a system and to estimate performance measures of the system.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.
Skills required for the use of mathematical modeling in solving various engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
The analytical thinking skills.
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.

Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Simulation with Arena, W. David Kelton, Randall P. Sadowski, and David T. Sturrock, 3rd Ed. 2004, McGraw-Hill.
- Simulation Modeling and Analysis 3rd Edition, A. L. Law, David Kelton, 3rd Ed, 2000, McGraw-Hill.

Design & Analysis of Experiments	
Code & No:	ME 483
Credits:	3 (3-1-0)
Pre-requisite:	STAT 101 -ME 111
Co-requisite:	NA
Level:	10

Module Description

Principles of experimental design. Randomized complete block designs. Latin square and Graeco-Latin square designs. General factorial designs. 2k Factorial designs. Response surface methodology and robust design. Planning, performing and analyzing industrial experiments.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Design & Analysis of Experiments, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • know how to design an experiment using the appropriate method and data analysis needed,
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of mathematical modeling in solving various engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.

The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
The analytical thinking skills.
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Design & Analysis of Experiments, Montgomery Douglas C, John Wiley and Sons, New York, 6e, 2005

Industrial Facilities Planning	
Code & No:	ME 484
Credits:	3 (3-1-0)
Pre-requisite:	ME 495
Co-requisite:	NA
Level:	10

Module Description

Fundamentals of facilities planning. Facilities design. Flow, space, and activity relationships. Material handling systems. Layout planning models. Warehouse operations. Quantitative facilities planning models. Preparing, presenting, implementing and maintaining facilities plan.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Industrial Facilities Planning, in addition to the abilty to apply the breadth

and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • To develop skills and learn modern analytical techniques useful for solving facilities planning problems in such areas as: Manufacturing Systems Design; Plant Layout; Material Handling Systems, Warehouse operations; Conveyors; and Cellular Manufacturing Systems • Understand the many qualitative considerations relevant to solving facilities planning problems.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Function on multi-disciplinary teams.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Facilities Planning, Tompkins, White et al. John Wiley, New Jersey, 2003.
- Manufacturing Facilities Design and Material Handling, Fred E. Meyers and Mathew Stephens, Pearson Prentice Hall, New Jersey, 2005.

Occupational biomechanics (Ergonomics)	
Code & No:	ME 485
Credits:	3 (2-1-2)
Pre-requisite:	ME 495
Co-requisite:	NA
Level:	10

Module Description

Introduction to Occupational Biomechanics. Review of kinematics and kinetics. Anthropometry. Mechanical work-capacity evaluation. Bio-instrumentation for Occupational Biomechanics. Biomechanical models. Methods of classifying and evaluating manual work. Manual material handling limits. Biomechanical considerations in machine control and workplace design. Hand tool design guidelines. Guidelines for seated work.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Occupational biomechanics, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Learn the basic concepts and design tools needed to consider the physiological basis of human work in the design of industrial operations, equipment and products.
- Understand how to design workspaces to accommodate human dimensions
- Learn how to determine when loads and forces encountered in manual tasks exceed human strength limits
- Understand how to prevent fatigue
- Learn how to design work environments
- Learn how to design physically demanding work for hot and cold environments
- Learn how to establish work schedules that prevent adverse effects of shift work
- Learn how to design manual material handling tasks that prevent back injuries

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Skills required for the use of modeling and prototyping to solve different engineering problems.

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.

The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.

The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work.
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Fitting the Task to the Human: A Text Book of Occupational Ergonomics, Kroemer, KHE & Grandjean, E. Taylor & Francis Publishers, London, 5e, 1997
- Occupational Ergonomics, Principles & Applications, Tayyari, F & Smith, J, Chapman & Hall: London, 1997

Design of Manufacturing Systems	
Code & No:	ME 486
Credits:	3 (2-1-2)
Pre-requisite:	ME 475
Co-requisite:	NA
Level:	10

Module Description

Study of recent developments in manufacturing, Japanese manufacturing techniques, hybrid manufacturing management system, supply chain management, total quality management, design for manufacturing and assembly. Manufacturing automation fundamentals and strategies; High volume manufacturing systems; Automated handling and storage systems; Automated inspection systems; Flexible manufacturing systems; Modeling of manufacturing systems.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Design of Manufacturing Systems, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Gain detaild knowledge in three areas: manufacturing processes and computer-integrated manufacturing systems, manufacturing system design and analysis, and modern manufacturing management strategies.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Production System and Computer Integrated Manufacturing, Groover, M.P. Automation, Prentice Hall.
- Modeling and Analysis of Manufacturing Systems, Askin, R.G. & Standridge, C.R. John Wiley & Sons.

- Factory Physics, Hopp and Spearman, Irwin 1996.

Product Design and Innovation	
Code & No:	ME 427
Credits:	3(2-1-2)
Pre-requisite:	ME 323 – ME 212
Co-requisite:	NA
Level:	10

Module Description

Introduction to manage innovation; Idea generation: use of scientific and technical knowledge to build product ideas; Product specification and quality Standardization of product; Product structure and components. Implementing prototype metrologies. Reverse engineering process and procedures & prototyping

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Product Design and Innovation, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand how to generate and evaluate creative ideas for the product, • Understand how to identify a potentially successful new product, • Understand how to manage the data and knowledge creayed during product development, • Understand and practice reverse engineering process.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.
Skills required for the use of mathematical modeling in solving various engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.

The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Design a system, component, or process to meet desired needs.
Function on multi-disciplinary teams.
Identify, formulate, and solve engineering problems.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Product Design and Development, Ulrich and Eppinger, McGraw-Hill, 2e, 2000

Computer Integrated Manufacturing	
Code & No:	ME 418
Credits:	3(2-1-2)
Pre-requisite:	ME 212
Co-requisite:	NA
Level:	10

Module Description

Introduction; Computer Aided Process Planning; Automated handling system and AS/RS concept, and configuration; Industrial Robots; Cellular Manufacturing Systems (CMS); Flexible Manufacturing Systems (FMS); Enterprise Integration and ERP.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Computer Integrated Manufacturing, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Gain an understanding of: Computer Aided Process Planning; Automated handling system, Industrial Robots; different Manufacturing Systems, • Be able to use Computer Integrated Manufacturing software tools, • Be able to design and develop control programs for various manufacturing equipment and judge their effectiveness.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The analytical thinking skills.
Ability for team work
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
The skills necessary to demonstrate cooperative planning and problem solving.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.

Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Chang, T.C. Wysk, R.A. & Wang, H.P, "Computer Aided Manufacturing," Prentice Hall, 1991.
- Bedworth, D.P. Henderson, M.R. & Wolfe, P.M. "Computer Integrated Design and Manufacturing," McGraw-Hill College, 1991.

Material Removal Processes	
Code & No:	ME 313
Credits:	3(2-1-2)
Pre-requisite:	ME 212 – ME 232
Co-requisite:	NA
Level:	8

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Material Removal Processes, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand: Mechanics of chip formation, Cutting forces and power, Effect of temperature on cutting and tool life, Metal removal rate, Cutting tool materials and cooling fluids used. • Be familiar with different Machining processes, • Be familiar with latest techniques in cutting process, e.g. Non-conventional machining and Numerical control of machine tools.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
Skills of hand drawing of sketches.
Ability for team work
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Module Description

Fundamentals of cutting. Mechanics of chip formation. Cutting forces and power. Effect of temperature on cutting. Tool life. Machinability: Metal removal rate, Cutting tool materials and fluids. Machining processes: turning, thread cutting, boring, drilling, reaming, milling, shaping and planing, broaching, gear cutting. Abrasives, grinding wheels, grinding processes. Super finishing process: Lapping, honing. blasting and peening. Non-conventional machining. Numerical control of machine tools.

- Metal cutting theory and practice, David A. Stephenson and John S. Agapiou, Marcel Dekker INC, 1996
- Metal Cutting Mechanics, Viktor P. Astakhov, CRC Press LLC, 1999

Materials Selection in Design and Manufacturing	
Code & No:	ME 333
Credits:	3(2-1-2)
Pre-requisite:	ME 212 + ME 232
Co-requisite:	NA
Level:	8

Module Description

Product life cycle. Performance of materials in service (failure of materials under mechanical loading, environmental degradation, selection of materials), effect of shape and manufacturing processes. Cost-per-unit-property method. Weighed properties method. Limits-on-properties method. Selection charts, computer-aided material and process selection (material databases). Case studies.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Materials Selection in Design and Manufacturing, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Product life cycle, Performance of materials in service, Effect of shape and manufacturing processes on performance of materials in service,
- Understand different selection methods (Cost-per-unit-property, Weighed properties, and Limits-on-properties),
- Be able to use selection charts, materials data base

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.

The skills of good technical writing.

The analytical thinking skills.

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Joseph Datsko, "Materials Selection for Design and Manufacturing," 2ed, CRC Press, 1997.
- Michael F. Ashby, "Materials Selection in Mechanical Design," 2ed, Butterworth-Heinemann, 1999.

Fault Diagnosis of Mechanical Systems	
Code & No:	ME 345
Credits:	2 (1-1-2)
Pre-requisite:	ME 343 + ME 232
Co-requisite:	NA
Level:	8

Module Description

Review of vibration: Free Vibration, Harmonically Excited Vibration, Fourier Analysis. Instruments: Transducers, FFT Analyzer, Sampling and Aliasing. Vibration problems: Imbalance, Misalignment, Bearings, Gears, Fans, Belts. Techniques and Maintenance Management. Sound; Basic Properties of Waves, Intensity, Power Level. Balancing: Static Unbalance, Dynamic Unbalance, Field Balancing.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Fault Diagnosis of Mechanical Systems, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Understand; Vibration problems, Imbalance, Misalignment, and problems of; Bearings, Gears, Fans, Belts.

• Understand machine fault detection methods including and the use of signal models, • Understand balancing: Static Unbalance, Dynamic Unbalance, Field Balancing.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of mathematical modeling in solving various engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
The skills necessary to demonstrate cooperative planning and problem solving.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Function on multi-disciplinary teams.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Machinery Vibration: Measurement and Analysis, Victor Wowk, McGraw-Hill, Inc. 1991
- Lecture Notes

Computer Aided Design	
Code & No:	ME 424
Credits:	3 (2-0-3)
Pre-requisite:	ME 323
Co-requisite:	NA
Level:	9

Module Description

Introduction to computer aided engineering environment. Solid modeling. Introduction to Finite Element Method. CAD packages. Static linear analysis in one, two, and three dimensions. Thermal analysis, introduction to non linear analysis. Optimum design. Computer applications in mechanical design.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Computer Aided Design, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Be able to use CAD packages and generate solid modeling of mechanical parts,
- Be able to apply Linear and Nonlinear analysis and Finite Element Method in design of mechanisms,
- Gain an understanding of Optimum design,

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Skills required for the use of modeling and prototyping to solve different engineering problems.

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.

The analytical thinking skills.

Ability for team work

The skills necessary to demonstrate cooperative planning and problem solving.

The skills necessary to develop a project or a business plan on a scientific and systematic basis.

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering area.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Function on multi-disciplinary teams.
Understand professional and ethical responsibility.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- The Finite Element Method in Machine Design, Eliahu Zahavi, Prentice Hall, 1992
- Mechanical Engineering Design, Shigley J. E. and Mischke C. R. McGraw-Hill, 2001

Metal Forming Processes	
Code & No:	ME 414
Credits:	3(2-1-2)
Pre-requisite:	ME 212 + ME 232
Co-requisite:	NA
Level:	9

Module Description

Yield criteria, plastic stress-strain relations. Plane stress, plane strain. Determination of flow stress. Applications in beam bending, instability in thin shells. Classification of metal forming processes. Bulk deformation processes. Techniques of analysis: slab method, upper bound method. Slip-line fields, application to indentation problem. Forging, rolling, extrusion. Rod and wire drawing equipment and dies.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Metal Forming Processes, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

• Gain an understanging of metal forming processes and the advantages and disadvantages of each, • Be able to select the forming method and the process parameters based on the features and application of the component, • Be able to analyze reasons for defects and suggest suitable remedies for reduce it,
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.
Skills required for the use of mathematical modeling in solving various engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Design a system, component, or process to meet desired needs.
Function on multi-disciplinary teams.
Understand professional and ethical responsibility.
Communicate effectively.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Manufacture Process for Engineering Materials, Addison, Wesley, 2005
- Mechanical Metallurgy, Mc-Graw Hill, 1976
- Engineering Plasticity, Van-Nostrand Reinhold, 1973.

Design and Production Lab (1)	
Code & No:	ME 491
Credits:	1 (0-0-2)
Pre-requisite:	ME 111
Co-requisite:	NA
Level:	9

Module Description

The design, execution, and evaluation of physical experiments in the area of solid mechanics, dynamics of physical systems and control. Digital simulation of linear systems using a software package (MATLAB). Emphasis on the application of classroom theory to experimental engineering and interpretation and presentation of results.

Module Aims

Provide students with:

- Gain an understanding regarding carrying out lab experements in areas of mechanical design, material enginnering, system dynamics, automatic control and mechanical vibrations.
- Show ability for data collection and analysis, Analog and digital signal analysis, Instrumentation specifications, etc.
- Have hands on laboratory experience of the experimental and practical design aspects of important mechanical engineering concepts
- Be able to apply digital simulation of linear systems using a software package (MATLAB)
- Be able to write good technical reports

Outcomes

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
The skills necessary to demonstrate cooperative planning and problem solving.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Textbooks and References

- NA

Computer Aided Manufacturing	
Code & No:	ME 415
Credits:	3(2-1-2)
Pre-requisite:	ME 212 – ME 424
Co-requisite:	NA
Level:	10

Module Description

Automation strategies. Production economics. High volume production systems. Automated flow lines. Assembly and line balancing. Numerical control. NC part programming. DNC, CNC, and adaptive control. Industrial robots. Material handling

and storage. Group technology and flexible manufacturing. Quality control and automated inspection. Control systems. Programmable controllers. Computer networks.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Computer Aided Manufacturing, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Gain an understandings of; Automation strategies, Automated flow lines. Assembly line balancing. Numerical control. NC part programming. DNC, CNC, and adaptive control, Industrial robots, Material handling and storage. Group technology and flexible manufacturing, Automated inspection. • Be able to perform basic CNC programming to direct a CNC machine to mchine parts, • Be able to optimize closed-loop feedback geins to quicken the response and increase the accuracy of position servomechanism
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
The skills necessary to demonstrate cooperative planning and problem solving.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
An understanding of professional and ethical responsibility.

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Design a system, component, or process to meet desired needs.
Function on multi-disciplinary teams.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Mikell P. Groover, and Emory W. Zimmers, Jr., "CAD/CAM: Computer-Aided Design and Manufacturing," Prentice Hall, Inc. 1990.

Design and Production Lab (2)	
Code & No:	ME 492
Credits:	1 (0-0-2)
Pre-requisite:	ME 491
Co-requisite:	NA
Level:	10

Module Description

Continue the course of Mechanical Design and Production Lab I concerning the design, execution, and evaluation of physical experiments in the area of solid mechanics, dynamics of physical systems and control. Digital simulation of linear systems using a software package (MATLAB). Emphasis on the application of classroom theory to experimental engineering and interpretation and presentation of results.

Module Aims

Provide students with:

• The skills necessary to carry out lab experements in areas of mechanical design, material enginnering, system dynamics, automatic control and mechanical vibrations, showing enough ability for data collection and analysis, Analog and digital signal analysis, Instrumentation specifications, etc. • Have hands on laboratory experience of the experimental and practical design aspects of important mechanical engineering concepts. • Be able to apply digital simulation of linear systems using a software package (MATLAB)
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.
Skills required for the use of mathematical modeling in solving various engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
The skills necessary to demonstrate cooperative planning and problem solving.
The skills necessary to develop a project or a business plan on a scientific and systematic basis.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.

Design and conduct experiments, as well as to analyze and interpret data.
Function on multi-disciplinary teams.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- NA

Powder Metallurgy	
Code & No:	ME 434
Credits:	3(2-1-2)
Pre-requisite:	ME 232
Co-requisite:	NA
Level:	9

Module Description

Introduction, powder metallurgy process, production of ferrous powder, powder, shaping, compaction, sintering behavior, microstructure changes, full-density, processing, heat treatment, finishing operations and properties, design consideration, products and applications.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Powder Metallurgy, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Gain an understanding of the powder metallurgy process and its parameters, heat treatment, finishing operations and properties,
- Be familier with design considerations, and the unique properties of the products and applications of Powder Metallurgy.

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.

The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
The analytical thinking skills.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Powder metallurgy of Iron and Steel, Randal M. German, John Wiley & Sons, 1998

Composite Materials	
Code & No:	ME 435
Credits:	3(2-1-2)
Pre-requisite:	ME 232
Co-requisite:	NA
Level:	9

Module Description

Classification. Applications. Processing and fabrication of composites (metal-matrix, ceramic-matrix, reinforced plastics, honeycomb materials, forming structural shapes). Design Considerations. Laminate structures. Stress-strain characteristics of fiber-reinforced materials. Lamination theory. Failure theories of fiber-reinforced materials. Environmentally induced stresses in laminates.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Composite Materials, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Be familiar with: Material classification, Applications Design Considerations, Processing and fabrication of composites,

• Be able to analyze composite materials, • Gain a prespective on the utilization of advanced composite materials in machine parts and structure.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
The analytical thinking skills.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Advanced Composite Materials, Louis A. Pilato and Michael J. Michno, Springer, 1994
- Mechanics of Composite Materials, Robert John, Taylor & Francis Inc, 1999

Introduction to Nanomaterials	
Code & No:	ME 436
Credits:	3(2-1-2)
Pre-requisite:	ME 232
Co-requisite:	NA
Level:	9

Module Description

Introduction and Definition, Types of nano materials, Nano composites, Mechanical Behavior of materials from Micro to nano level, Nano materials and nano structures, Mechanical, physical, electrical, optical and magnetic properties of nano materials, Failure mechanism in nano materials, Fatigue and Fracture of MEMS and NEMS, Characterization Techniques HRTEM, AFM, Raman Spectroscopy, Potential applications of nano materials.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Introduction to Nanomaterials, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Gain an understanding of: Nanomaterials types, Nano composites, Nano materials and nano structures, Mechanical, physical, electrical, optical and magnetic properties of nano materials, Failure mechanism in nano materials, and Potential applications of nano materials,
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
The analytical thinking skills.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Nanomaterials, Nanotechnologies and Design, An Introduction for Engineers and Architects, Daniel L. Schodek, Paulo Ferreira and Michael F. Ashby, Elsevier Inc, 2009

Non destructive Examination of Materials	
Code & No:	ME 437
Credits:	3(2-1-2)
Pre-requisite:	ME 232
Co-requisite:	NA
Level:	9

Module Description

Introduction to the fundamentals and applications of non destructive examination. Nondestructive Examination Methods: Ultrasonics, Magnetic Particle, Liquid Penetrant, Acoustic Emission, Eddy Current, Radiography; Qualification and Certification of NDT Personnel.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Non destructive Examination of Materials, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Be familiar with Nondestructive Examination Methods and Applications,
- Be aware of limitations of NDT,
- Be able to evaluate data from NDT,
- Be aware of Qualification and Certification of NDT Personnel.

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.

Ability to design and conduct experiments, as well as to collect, analyze and interpret data.

The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.

The analytical thinking skills.

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.

Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and Reference

- Nondestructive Testing Techniques, Ravi, Dean, Research & Consultancy Division, and Birla Institute of Technology & Science, New Age Science, 1999
- Practical Non-Destructive Testing, B. Raj, Alpha Science Int'l Ltd; 3rd edition, 2007

Machine Tools Design	
Code & No:	ME 425
Credits:	3(2-1-2)
Pre-requisite:	ME 323 – ME 212
Co-requisite:	NA
Level:	10

Module Description

Design and working principles of machine tool elements (Speed and feed of gear boxes. spindle and spindle bearings, rigidity and strengthening of structures- frames, beds and design of slideways against wear). Power sources and types of drives. Mechanisms design, motion control and transmission systems in machine tools. Safety devices. Static and dynamic acceptance tests for machine tools.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Machine Tools Design, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand design and working principles of machine tool elements and Mechanisms, and Safety devices. • Be able to design machine elements to meet design specifications such as material selection, type of geometry, sizing and safety factor; • Be familiar with the right Codes and Standards.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Modular design for machine tools, Yoshimi Ito, McGraw-Hill, 2008

Design of Production Facilities	
Code & No:	ME 426
Credits:	3(2-1-2)
Pre-requisite:	ME 323 – ME 212
Co-requisite:	NA
Level:	10

Module Description

Hoisting machinery: crane chains, sprockets, pulleys, drums, ropes, sheaves and hooks. Gain in force and gain in speed systems. Wheels, rails, and drives. Jigs and fixtures: specifications of jigs and fixtures, conventions in fixture design. Degrees of freedom, location points, fixation point. Clamping devices, fool-proofing, Rigidity and wear considerations.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Design of Production Facilities (material handling systems and conveyors), in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand design and working principles of material handling elements and mechanisms, and their safety considerations. • Be able to design material handling elements to meet design specifications such as material selection, type of geometry, sizing and safety factor; • Be familiar with the right Codes and Standards.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.

Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Strategies for Creative Problem Solving, Fogler, and LaBlanc, Printice Hall, 1995
- Mechanical Engineering Design, Shigley J.E. and Mischke C.R. McGraw-Hill, 2001

Product Design and Innovation	
Code & No:	ME 427
Credits:	3(2-1-2)
Pre-requisite:	ME 323 – ME 212
Co-requisite:	NA
Level:	10

Module Description

Introduction to manage innovation; Idea generation: use of scientific and technical knowledge to build product ideas; Product specification and quality Standardization of product; Product structure and components. Implementing prototype metrologies. Reverse engineering process and procedures & prototyping

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Product Design and Innovation, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Understand how to generate and evaluate creative ideas for the product, • Understand how to identify a potentially successful new product, • Understand how to manage the data and knowledge creayed during product development, • Understand and practice reverse engineering process.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.
Skills required for the use of mathematical modeling in solving various engineering problems.

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.
Skills of hand drawing of sketches.
The skills of good technical writing.
The analytical thinking skills.
Ability for team work
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design and conduct experiments, as well as to analyze and interpret data.
Design a system, component, or process to meet desired needs.
Function on multi-disciplinary teams.
Identify, formulate, and solve engineering problems.
Communicate effectively.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Product Design and Development, Ulrich and Eppinger, McGraw-Hill, 2e, 2000

Tribology	
Code & No:	ME 428
Credits:	3(2-1-2)
Pre-requisite:	ME 323 – ME 212
Co-requisite:	NA
Level:	10

Module Description

Nature of solid surfaces. Interaction of solid surfaces. Friction of metals and non-metals (mechanisms, theories, applications). Wear of metals and non-metals (types, mechanisms, theories, applications). Lubrication (methods, types, theories, applications). Lubricants (types, utilization) Selection of materials for tribological applications. Surface Engineering.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Tribology, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Gain an understanding of the theory and practice of: Friction, Wear, and Lubrication
- To be able to select materials for tribological applications.
- Learn about emerging area such as micro-nano tribology.

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

Experience and skills necessary to take advantage of computer in dealing with different engineering applications.

The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.

The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.

The analytical thinking skills.

Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.

Design and conduct experiments, as well as to analyze and interpret data.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Fundamental of tribology, R. Gohar, Imperial College Press, 2008.
- Engineering Tribology, J. Williams, Cambridge University Press,2005.

Welding Technology	
Code & No:	ME 416
Credits:	3(2-1-2)
Pre-requisite:	ME 212
Co-requisite:	NA
Level:	10

Module Description

Fusion welding. Weldability. Selection of welding electrodes. Hot cracking. Cold cracking. Welding metallurgy, heat affected zone. Welding of heat-treatable alloys. Welding of dissimilar alloys. Destructive and nondestructive testing of welds. Weld thermal cycles and residual stresses. Welding in manufacturing: pressure vessels, boilers and ship building industries; welding in automotive maintenance. Welding codes.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Welding Technology, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to:

- Gain an understanding of different types of welding techniques, their features, and applications,
- Be able to know how to weld various types of materials,
- Be able to diagnose welding defect and problem,
- Be able to perform different testing for welding zone,
- Be aware with welding codes.

Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications

The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.

The skills necessary to demonstrate cooperative planning and problem solving.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Identify, formulate, and solve engineering problems.
Understand professional and ethical responsibility.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Howard B.Cary, and Scott C. Helzer, "Modern Welding Technology," 6th ed, Prentic Hall, 2004.
- Robert W. Messler, "Principles of Welding: Processes, Physics, Chemistry, and, Metallurgy," 1st ed, Wiley VCH, 1999.

Advanced Manufacturing Technology	
Code & No:	ME 417
Credits:	3(2-1-2)
Pre-requisite:	ME 212
Co-requisite:	NA
Level:	10

Module Description

Non-conventional machining: Principles, Ultrasonic machining, Electromechanical Machining, Electro-discharge Machining, Plasma Arc Machining, Laser Beam Machining, Electron Beam Machining. Numerical Control of Machine Tools: Automation of Manufacturing Processes, Numerical Control, Coordinate systems, Types and components of CNC systems, Programming for CNC, Adaptive control, Computer Integrated Manufacturing.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Advanced Manufacturing Technology, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Gain an understanding of the features of the different types of the nontraditional manufacturing processes, • Be able to present enough knowledge and information following the current trends in manufacturing, • Be abale to evaluate and analyze manufacturing engineering,
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of prototyping to solve different engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Exploring Advanced Manufacturing Technologies [Illustrated], Steve Krar, Arthur Gill, Industrial Press, Inc. 2003

Computer Integrated Manufacturing	
Code & No:	ME 418
Credits:	3(2-1-2)
Pre-requisite:	ME 212
Co-requisite:	NA
Level:	10

Module Description

Introduction; Computer Aided Process Planning; Automated handling system and AS/RS concept, and configuration; Industrial Robots; Cellular Manufacturing Systems (CMS); Flexible Manufacturing Systems (FMS); Enterprise Integration and ERP.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Computer Integrated Manufacturing, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Gain an understanding of: Computer Aided Process Planning; Automated handling system, Industrial Robots; different Manufacturing Systems, • Be able to use Computer Integrated Manufacturing software tools, • Be able to design and develop control programs for various manufacturing equipment and judge their effectiveness.
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The experience and skills necessary to use resource materials, technical equipment and engineering tools necessary for engineering practice.
Ability to design and conduct experiments, as well as to collect, analyze and interpret data.
The analytical thinking skills.
Ability for team work
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
The skills necessary to demonstrate cooperative planning and problem solving.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.

Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Chang, T.C. Wysk, R.A. & Wang, H.P, "Computer Aided Manufacturing," Prentice Hall, 1991.
- Bedworth, D.P. Henderson, M.R. & Wolfe, P.M. "Computer Integrated Design and Manufacturing," McGraw-Hill College, 1991.

Finite Elements Methods	
Code & No:	ME 419
Credits:	3(2-1-2)
Pre-requisite:	ME 232 – ME 424
Co-requisite:	NA
Level:	10

Module Description

Virtual formulation. Finite element analysis: shape formation, equilibrium conditions, element classification, assembly of elements, modeling methodology. Structures and elements: trusses, beams, 2-D solids, 3-D solids, axisymmetric solids, thin-walled structures. Dynamic analysis. Heat transfer and thermal analysis.

Module Aims

Provide students with:

An understanding of the definition, necessary backgournd and importance of the subject of Finite Elements Methods, in addition to the abilty to apply the breadth and depth of this subject including the basic terminology, concepts, principles and theories of it in order to: • Gain an understanding of finite element formulation for different engineering applications, • Be able to use finite elemet software tools
Ability to follow a scientific methodology in using the basics and principles of mechanical engineering in handling engineering applications
Skills required for the use of modeling and prototyping to solve different engineering problems.
Experience and skills necessary to take advantage of computer in dealing with different engineering applications.
The skills necessary to communicate concepts and experimental results in clear and logical fashion, both verbally and in writing.

The analytical thinking skills.
The skills necessary to define, analyze, and solve problems to reach proper conclusions and to communicate these conclusions with others.
An understanding of professional and ethical responsibility.
Some of the knowledge and skills necessary to pursue professional careers in mechanical engineering arena.

Outcomes

Apply knowledge of mathematics, science, and engineering.
Design a system, component, or process to meet desired needs.
Identify, formulate, and solve engineering problems.
Understand the impact of engineering solutions in a global and societal context.
Recognize the need to engage in life-long learning.
Gain knowledge of contemporary issues.
Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbooks and References

- Finite Element Procedures, Bathe, K. J. Prentice-Hall, 1995.