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 251
Credits:	3(3-1-0)
Pre-requisite:	NA
Co-requisite:	NA
Level:	5

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