Course Title: Fundamentals of Engineering Technology	
Code:	GE 101
Credit Hours:	2 (1,0,2)
Pre-requisite:	None
Co-requisite:	None

Course Description

Introduction to principles of production, Function and planning of workshop, Industrial safety, Measurements, Engineering materials, Bench work and filling, sheet metal work, Metal machining (drilling, turning, shaping, milling, grinding), Metal forming; forging processes, rolling, extrusion, Foundry and pattern making, Joining of materials (fastening, riveting, welding).

Course Objectives

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

- Be familiar with different departments within the workshop,
- Be able to layout workshops,
- Be familiar with safety considerations,
- Be acquainted with the classification, properties, and use of engineering materials,
- Be able to use different measuring instruments and handtools,
- Be Acquainted with the basic manufacturing processes.

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

- Skills of hand drawing of sketches.

Course Outcomes

- Understand various manufacturing materials, their sources, properties and uses.
- Demonstrate competency in the Conventional Measuring System (inches/feet) and in the Metric Measuring System.
- Define the processes of changing raw Materials into finished products
- Develop basic skills and safe use of manufacturing equipment and tools.

Textbook:

- R. Singh, :Introduction to Basic Manufacturing Processes and Workshop Technology," New Age International (P) Ltd Publishers, 2006.

Reference:

Course Title: Fundamentals of engineering drawing	
Code:	GE 102
Credit Hours:	3 (1,0,4)
Pre-requisite:	None
Co-requisite:	None

Course Description

Introduction, Skills of freehand sketching, Basics of lettering, Methods of projection and orthographic projection using drawing tools, Dimensioning of views, Third view prediction, Auxiliary views, Intersections of surfaces and bodies, Isometrics, Sectional views.

Course Objectives

- An understanding of the definition, necessary background and importance of the subject of Engineering Drawing, apply the basic terminology, concepts, principles and theories.
- Understand the importance of Eng. Drawing.
- Practice of dimensioning of drawings, Undertake different geometric objects, projections of straight lines, planes and solids.
- Take up different orthographic projections, Draw sectional views, development of surface of different solids.

Course Outcomes

- Understand the importance of Eng. Drawing.
- Practice of dimensioning of drawings.
- Undertake different geometric objects, projections of straight lines, planes and solids.
- Take up different orthographic projections.
- Draw sectional views, development of surface of different solids.

Textbook:

- Gary Robert, Eric N wiebe, "Fundamentals of graphics Communications," McGraw Hill.

Reference:

- William Howard, Joe Musto, "Introduction to solid Modeling Using Solid Works," McGraw Hill, 2005

Course Title: Engineering Mechanics (Statics)	
Code:	GE 103
Credit Hours:	3 (3,1,0)
Pre-requisite:	None
Co-requisite:	None

Course Description

Introduction to engineering mechanics; Force systems and vectors in 2D and 3D systems; Moments, couples in 2D, 3D dimensions and resultants; Centroids and center of gravity; Moment of inertia of area and masses; Equilibrium of force systems; Friction; Principle of virtual work.; Then analysis and estimate of various forces on engineering structures.

Course Objectives

- Introduce the students to engineering mechanics.
- Outline the force systems and vectors in 2D and 3D dimensions.
- Explain the moments, couples in 2D, 3D dimensions.
- Describe the main principles of methods of Centroids and center of gravity.
- State the moment of inertia of area and masses and indicate the equilibrium of force systems on various engineering structures
- Outline the main friction forces on a structure
- Outline the principle of virtual work occurred on various structures.
- Then, students should be able to analysis and evaluate of various effects on engineering structures such as beams and trusses.

Course Outcomes

- The student will be able to study and determine of force systems, force resultant and equilibrium on various engineering structures such as beams, frames, arches, trusses.
- Then, the student will be able to use the gained force and equilibrium knowledge to analyze engineering structures.
- The student will be able to study the effect of friction and the applications of Principle of Virtual Work on the resultant forces and equilibrium of engineering structures.
- The student will be able to justify the series steps taken to solve the problems.
- The student will be able of making a precise decision on choosing the right solution or alternative solutions.
- During the office hours where student are urged to asked to solve problems.
- The student will be able of using email and website to let the student to be in contact with his instructor and be able of using Trigonometry to solve engineering problems.

Textbook

Hibbeler, R.C., "Engineering Mechanics STATICS", Prentice Hall; Latest Edition.

Reference Book

Meriam, J.L and Kraige, L.G., "Engineering Mechanics STATICS", latest Edition.

Course Title: Engineering Technical Writing	
Code:	GE 306
Credit Hours:	2 (2,0,0)
Pre-requisite:	STAT 201
Co-requisite:	None

Course Description

This course is aimed at teaching Junior Engineering students how to write a technical report. The report includes in its topics, definitions of technical reports, types of reports, Front matter (cover and page title, abstract, acknowledgement, table of contents, list of figures, tables and lists of abbreviations/acronyms), report body (introduction with background problems, objectives, aim/scope of report, including methodology, results analysis and discussion, conclusions and recommendations) and back matter (references, biographies and appendices). During course, various exercises with common mistakes in writing technical reports would be given along with their solutions. Student has to write project report about topic of their field covering the all components of technical report. Students are also taught the difference between a top down report and a task oriented one.

Course Objectives

- Get students acquainted with different types of technical reports and what do they consist of typically.
- Teach students how to write each report section of an abstract, introduction, background, Problem statement, simulation results, discussions and conclusions parts, as well as appendices and biography.
- Teach students how to make their reports objective, comprehensive and productive.
- Teach students different standard parts of a technical report such as tables, abbreviations, figures.

Course Outcomes

- Students should be able to write a technical report that is both efficient and comprehensive.
- Students should learn how to write problems, express their thoughts and make problems and results analysis.
- Students should be able to write technical reports in a clear and correct manner in terms of grammar and standard reports parts.
- Students should learn how to write a problem statement report in a top down manner or in a task oriented manner.

Textbook:

- A Guide to Writing as an Engineer, David Beer and David McMurrey, Wiley 4th edition.

Course Title: Logic Design	
Code:	GE 408
Credit Hours:	3 (2,1,0)
Pre-requisite:	None
Co-requisite:	None

Course Description

This course addresses Introduction of project planning and scheduling, Project charter, Scope statement, Work Breakdown Structure, Responsibility Chart. Network diagram, Schedule analysis and possibilities using the Critical Path Method (CPM) and the Program Evaluation and Review Technique (PERT). Resource leveling and allocation, Time-cost trade off (Crashing a schedule), Gantt chart, Time overlaps, Time and cost control, Risk monitoring and control, Computer applications.

Course Objectives

The purpose of this course is to familiarize students with some of the project management concepts and principles. Students will gain as result a sound understanding to deal with the management challenging associated with complexity nature of the large projects and that by providing related topics of how projects can be managed more effectively. The course address not special focuses on one type of project but basic nature of managing general projects. It is also provide topics of how projects can be managed under tight schedules and limited resources. The students to assimilate the course knowledge will apply relevant tools and techniques taken in the class by simulation exercises using examples of project case studies.

Course Outcomes

- Development of an engineering project plan.
- Preparing and applying project schedules using AON, AOA, PERT and Bar chart methods.
- Determine project schedule for purpose of resource levelling and allocation and time-cost trade-off.
- Time and cost monitoring and controlling for an engineering projectAssessment and management of project risks

Textbook:

Gray, Clifford F. and Erik W. Larson. 2011. Project Management: The Managerial Process. 5th edition. McGraw-Hill Irwin Publishers.

Reference:

Kerzner, Harold (2003) Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 8th Edition, John Wiley & sons, USA.

Course Title: Engineering Chemistry	
Code:	GE-105
Credit Hours:	4 (3 lecture, 1 exercise)
Pre-requisite:	None
Co-requisite:	None

Course Description

Fundamentals of Chemistry : Stoichiometry, Atomic structure, Chemical bonding, Chemical kinetics, Chemical equilibrium and Fundamentals of organic chemistry

Energy and Matter: States of matter, Gas state and gas laws, Classical Chemical thermodynamics, laws, common terms and concepts.

Materials Science: Introduction to materials science. Metals, building materials, Steel, Aluminum, Corrosion and corrosion resistance.

Non-metallic Materials: Polymers- structure, physical properties and applications of polymers. High performance ceramics and glasses. Chemistry of cement.

Electrochemistry: Electrical conduction, basic theories of metallic and electrolytic conduction. Electrolytic cells, Electrodes and standard electrode potentials. Electronic materials and semiconductor properties.

Fuel and petrochemicals: Coal, oil and natural gas. Petrochemical industry

Course Objectives

- **The main purpose this course is to understand the basic concepts and fundamentals of engineering chemistry.**
- **Engineering Chemistry provides a core of fundamental chemistry and applied chemistry along with the skills and tools needed by a professional engineer.**

Course Outcomes

At the completion of this course, the successful student will be able to:

- Understand the basic concepts and fundamentals of Engineering Chemistry.
- Develop certain team work activities such as communication ability with others, confidence, listen and understand problem solving, decision making abilities.
- Understand the methods and rules to solve the numerical involving chemical formulas and equations.
- Exhibit knowledge of scientific concepts through written and oral communication.

Textbook:

1. General Chemistry, Atoms First, John McMurry, Robert C. Fay, 4th. Ed. Prentice Hall, February 2009.

2. Engineering Chemistry, Extended Edition, Wiley India, ISBN: 9788126536337

Reference:

Engineering Chemistry, P.R.Vijayasarathy, 2th. Ed. Eastern Economy

Course Title: Dynamics	
Code:	GE 108
Credit Hours:	3 (3,1,0)
Pre-requisite:	GE 103
Co-requisite:	None

Course Description

Kinematics and kinetics of a particles and bodies. Review of particle motion Rotation and translation of a rigid body in a plane. General motion, Displacement velocity and acceleration of rigid bodies including Coriolis motion. Motion about a fixed point. Equations of motion for rigid bodies. Constrained plane motion. Work and energy. Impulse and momentum. Principle of conservation of energy. Gyroscopic motion and Introduction to mechanical vibrations.

Course Objectives

- To introduce the basic concepts of dynamics as applied to particles and bodies.
- To introduce different type of motions and governing equations and describe and predict the motion experienced by particle & bodies.
- Understand the basic principles of 2D rigid body motion.
- To study the effect of vibrations on different systems and governing equations of motion.
- To develop analytical skills relevant to the above mentioned concepts.

Course Outcomes

- Understand the importance of Kinematics of a particle in rectilinear motion and apply on related problems.
- Select and use an appropriate coordinate system to describe particle motion
- Understand and evaluate the importance of Kinematics of a particle in curvilinear motion.
- Evaluate Kinetics of a particle in motion relating Newton's Second Law & Equations of motion.
- Evaluate the importance of Kinematics of a rigid body in motion.
- Evaluate the importance of Kinetics of a Rigid body in different motions

- Apply the knowledge gained to solve practical problems involving dynamic forces and equilibrium.
- Understand the basics of dynamics involved in various Engineering applications

Textbook:

- *Hibbeler, R.C., Engineering Mechanics: Dynamics, Seventh Edition, Prentice Hall.*

Reference:

- *Vector Mechanics for Engineers: Dynamics, by F. P. Beer, E. R. Johnston, and William E. Clausen, published by McGraw-Hill.*

Course Title: Engineering Economy	
Code:	GE-407
Credit Hours:	2(2 lecture, 1 exercise)
Pre-requisite:	None
Co-requisite:	None

Course Description

Introduction to engineering economics: Time value of money, interest rate, rate of return (ROR), minimum attractive rate of return (MARR) , compound amount interest rate

Economic Equivalence: cash flow diagram , how time and interest affect money value, finding equivalent of cash flow diagram at desired point of time and single payment, conditions for two cash flows to be equivalent, single payment equivalent, uniform series equivalent, arithmetic gradient equivalent

Present worth (PW) analysis: Formulating alternatives, present worth analysis of equal-life alternatives, present worth analysis of different-life alternatives, Evaluation of Independent Projects

Annual worth (AW) cash flow analysis: AW Value Calculations, Evaluating Alternatives Based on Annual Worth, AW of a Permanent Investment

Rate of return (ROR) analysis: interpretation of ROR values, ROR calculation, understanding incremental ROR analysis, ROR evaluation of two or more mutually exclusive alternatives

Project uncertainty: Range of estimated variables to evaluate a project, describe possible outcomes with probability distributions, combine probability distributions for individual variables into joint probability distributions, use expected values for economic decision making

Replacement decision and benefit-cost analysis: Basics of a replacement study, economic service life, performing a replacement study, defender replacement value

Inflation and price change: Understanding the impact of inflation, pw calculations adjusted for inflation, aw calculations adjusted for inflation

Cost accounting: How cost estimates are made, before-tax and after-tax alternative evaluation

Course Objectives

- Prepare Engineering students to analyze cost /revenue data and to carry out an economic analysis leading to decision making process either to accept or reject the given alternatives on economic basis.
- The students can contribute immensely in production economy, product costing, and decisions pertaining to replacement of machines

Course Outcomes

At the completion of this course, the successful student will be able to:

- Understand the basic concepts and fundamentals of Engineering Economy.
- Students can develop decision making abilities to compare alternatives like comparing machines, projects on the basis ROR, or PW to make cost effective decisions.
- Students can interpret and analyze the investments, financial borrowings, cost benefits analysis
- Students can carryout economic analysis of replacement of aging machines.

Textbook:

1. Leland Blank, P.E., and Anthony Tarquin, P.E., "Engineering Economy", McGraw-Hill, 6 Ed., 2005

2. Sullivan, W. G., Bontadelli, J. A. and Wicks, E. M., "Engineering Economy", 11th ed., Prentice Hall, Upper Saddle River, New Jersey, 2001

Reference:

1. Newnan, Eschenbach, Lavelle, Engineering Economic Analysis, 11th edition, 2011, Oxford University Press

2. Panneselvam, Engineering economy, PHI, New Delhi, 2015

Course Title: Differential Calculus	
Code:	MATH105
Credit Hours:	3 (3,1,0)
Pre-requisite:	None
Co-requisite:	None

Course Description

Differential calculus (MATH105) is a subfield of calculus concerned with the study of the rates at which quantities change. It is one of the two traditional divisions of calculus, the other being integral calculus (MATH106). The primary objects of study in differential calculus are the derivative of a function, related notions such as the differential, and their applications. The derivative of a function at a chosen input value describes the rate of change of the function near that input value.

Description of the knowledge to be acquired

1- Calculate the derivatives of different types of functions.

3- Use some techniques of derivatives to solve different differential problems

4-Use derivative to find equations of normal and tangent lines.

5- Use Differential calculus in engineering applications

6-Use derivatives to find extreme values of a function.

7-Several variables function, Limit and continuity and their derivatives.

Course Objectives

- Limit, Continuity, Derivatives: (definition, properties)
- Chain rule, implicit differentiation, Higher order derivatives, Equations of tangent and normal lines
- Differentiation of (trigonometric, logarithmic, exponential, hyperbolic, inverse of trigonometric, inverse of hyperbolic) functions
- Local extrema, concavity
- Related rates ,horizontal and vertical asymptotes

- Applications of derivatives (Mean Value Theorem, Rolle's Theorem).
- Function into two or three variables: their limits, their continuity
- Partial derivatives

Course Outcomes

- Apply knowledge of mathematics in other sciences and engineering.
- An ability to identify, formulate, and solve engineering problems.
- Ability to solve rates and related problem.

Textbook:	1.Thomas, G. B. and Finney, R. L., " Calculus and Analytic Geometry", Addison Wesley, (12th edition)
Reference Books	2. Stewart, J.," Calculus: Early Transcendentals ", Brooks/Cole, Cengage learning, 7th edition, 2012. 3. Howard Anton "Calculus: Early Transcendentals", JOHN WILEY & SONS, INC, 12th edition.

Course Title: Differential Calculus	
Code:	MATH106
Credit Hours:	3 (3,1,0)
Pre-requisite:	MATH105
Co-requisite:	None

Course Description

- Integral(definitions of indefinite and definite integral)
- Fundamental theorem of calculus, Area
- Techniques of integration: substitution, by part, partial fraction
- Integration of inverse trigonometric functions, of logarithmic and exponential functions, of hyperbolic and inverse hyperbolic functions
- Improper integrals. Double integral, areas and volumes
- Double integrals in polar coordinates.
- Triple integral in cylindrical and spherical coordinates, volume, moment and center of mass
- Vector fields, line integrals, surface integrals
- Green's theorem, the divergence theorem, Stoke's theorem.

Course Objectives

1. Calculate the integral of functions which admit an usual primitives.
2. Determine the property and formulation of academic integrals.
3. Use some techniques of integration to solve different integration problems
4. Improper integration and its different types
5. Use integration calculus in engineering applications: calculus of areas, volumes
6. Use double integral calculus, areas and volumes.
7. Double integrals in polar Coordinates
8. Use triple integral in cylindrical and spherical coordinates calculus volume,
9. moment and centre of mass, Vector fields, line integrals, surface integrals,

10. Green's theorem, the divergence theorem and Stokes' theorem

Course Outcomes

- Apply knowledge of mathematics in other sciences and engineering.
- An ability to identify, formulate, and solve engineering problems.
- A knowledge of contemporary issues

Textbook:	1.Thomas, G. B. and Finney, R. L., " Calculus and Analytic Geometry", Addison Wesley, (12th edition)
Reference Books	2. Stewart, J.," Calculus: Early Transcendentals ", Brooks/Cole, Cengage learning, 7th edition, 2012. 3. Howard Anton "Calculus: Early Transcendentals", JOHN WILEY & SONS, INC, 12th edition.

Course Title: Algebra and Analytical Geometry	
Code:	MATH 107
Credit Hours:	3 (3,1,0)
Pre-requisite:	None
Co-requisite:	None

Course Description

Solving a system of linear equations in different methods (Gauss-Jordan, Inverse of coefficient matrix, Cramer's rule). Carry out arithmetic operations and define the characteristic of academic geometric shapes in vector space. Find the directional derivatives . Solving sketching the Conic sections . Determine the convergence or the divergence of series and calculate the limits in possible cases

Course Objectives

- Matrices: introduction and properties
- System of linear equations: introduction and method of solving
- Determinants and Cramer's rule
- Vectors in 2 and 3 dimensions, scalar and vector product
- Eigenvalues and eigenvectors: introduction and properties
- Partial fractions
- Vector valued functions
- Directional derivatives
- Conic sections
- Infinite series: convergence and divergence
- Test of convergence: integral, ratio, comparison
- Conditional and absolute convergence
- Equation of lines and planes in space, Power series

Course Outcomes

-Apply knowledge of mathematics, science, and engineering.

-An ability to identify, formulate, and solve engineering problems.

-A knowledge of contemporary issues

-Solve a system of linear equations using matrix inverse and Cramer's rule.
-Calculate eigenvalues and eigenvectors for a square matrix.

-Find the partial fraction for a rational function.

-Manipulate vectors in 2D and 3D.

-Write equations of lines and planes and convert between coordinate systems.

-Describe vector-valued functions and find directional derivatives, tangent planes, and normal lines to surfaces.

-Determine conic sections.

– Work on infinite series and determine if a given series is convergent, divergent, or cannot be determined.

Textbook:

1-Anton, H. and Rorres, C., " Elementary linear algebra: Application version", Wiley, 10th edition, 2010.

2- Anton, H., " Calculus: Anew Horizon ", Wiley, 6th edition

Reference:

-Kolman, B. and Hill, D., "Elementary linear algebra with applications", Wiley, 9th edition ,2007.

Course Title: Differential Equations	
Code:	Math 204
Credit Hours:	3 (3,1,0)
Pre-requisite:	Math 106 and Math 107
Co-requisite:	None

Course Description

Cove r the First order and first degree differential equations: equations with separable variables, homogeneous and non homogeneous equations exact and non exact equations, linear and non linear equations. The linear first order equations of higher degree. The linear second order equations: direct deduction, comparison theorems, variation of parameters, and the inverse differential operator. Systems of differential equations. Series Solutions of Linear Differential equations. Laplace transform and Fourier Series, their applications to solve linear differential equations,

Course Objectives

- Resolution of first order and first degree differential equations: equations with separable variables, homogeneous and non homogeneous equations, exact and non exact equations, linear and non linear equations.
- Resolution of first order differential equations of higher degree and linear second order differential equations, by different methods: direct deduction, comparison theorems, variation of parameters and the inverse differential operator.
- Use of Laplace transform and Fourier Series techniques to solve linear differential equations.
- Applying various mathematical operations and analysing its results correctly.

Course Outcomes

1-Resolution of first order and first degree differential equations: equations with separable variables, homogeneous and non homogeneous equations, exact and non exact equations, linear and non linear equations.

2- Resolution of first order differential equations of higher degree and linear second order differential equations, by different methods: direct deduction, comparison theorems, variation of parameters and the inverse differential operator.

3- Use of Laplace transform and Fourier Series techniques to solve linear differential equations.

Textbook:

-Boyce, W and DiPrima ,R., Elementary Differential Equations and Boundary Value Problems, Wiley, 9th edition ,2009.

Reference:

-Kreyszig, E., Kreyszig, H. and Norminton, E. Advanced Engineering Mathematics, Wiley, 10th edition ,2011.

Course Title: Numerical Methods	
Code:	Math 254
Credit Hours:	3 (3,1,0)
Pre-requisite:	Math 204
Co-requisite:	None

Course Description

Mathematical Preliminaries and Error Analysis. Solutions of Equations in One Variable

Interpolation and Polynomial Approximation. Direct Methods for Solving Linear Systems. Iterative Techniques in Matrix Algebra. Approximation Theory. Numerical Differentiation and Integration. Initial-Value Problems for Ordinary Differential Equations.

Course Objectives

- Cover the common numerical methods for solving algebraic and transcendental equations
- Cover the methods of Solving linear system of equations
- Cover the common methods used for interpolation
- Cover the common methods of Curve fitting
- Cover the common methods of solving ordinary differential equations

Course Outcomes

- Solve algebraic and transcendental equations numerically
- Solve linear system of equations numerically
- Perform a numerical integration
- Perform a numerical differentiation
- Perform Curve fitting of experimental data
- Perform interpolation of a set of data
- Solve ordinary differential equations numerically

Textbook:

- Burden,R. L. and Faries, J. D., Numerical Analysis, 9th edition. Brooks/Cole Cengage Learning, 2011.

Reference:

- Steven Chapra and Raymond Canale, Numerical Methods for Engineers, 6 edition. McGraw Hill, 2010.

Course Title: Statistics and Probability	
Code:	STAT 201
Credit Hours:	3 (3,1,0)
Pre-requisite:	None
Co-requisite:	None

Course Description

Descriptive statistics: statistical classification of data, measures of central tendency (mean, median, mode for raw and grouped data), measures of dispersion (range, mean deviation, quartile deviation, standard deviation and variance). Simple and multiple linear regressions, significance tests, estimation, sampling. Statistical software (Excel, StatGraph, MiniTab) and their applications. Probability: introduction, properties, Conditional probability, Bayes law, applications. Random variables: discrete and continuous random, the expected value and variance, sums of discrete random variables. Selected distributions: Uniform, Poisson, Exponential, and Normal

Course Objectives

- Use the engineering experiments, statistics and data classifications
- Calculate the Measures of Central Tendency, Dispersion and Positions for ungrouped data
- Define and find the sample space, event, Axioms of Probability, conditional probability ,independence, Random variables (discrete and continuous)
- Use Common Distributions: Bernoulli, Binomial, Poisson, Normal and Exponential distribution
- Calculate the Confidence Intervals CI: Large and small sample CI for population mean, CI for proportion, CI for the difference between two means
- Test the Testing Hypothesis: Small sample t- test for population mean.

- Calculate the correlation coefficient and find the least square line equation.

Course Outcomes

- Apply knowledge of mathematics, science, and engineering.
- An ability to identify, formulate, and solve engineering problems.
- Graphical presentation and summery of collected observations
- Calculation of the probability from probability distribution functions
- Making statistical inferences about a population based on a sample drawn from it
- Give meaning to the central tendency and dispersion
- Give meaning to probability density function and cumulative distribution function
- Define the relation between the correlation and regression
- Define testing hypothesis and it's engineering applications
- Scientific thinking through problems solving.

Textbook:

- William Navida , Statistics for Engineers and Scientists, 3rd edition. McGraw-Hill, 2011. ISBN 978-0-07-337633-2

Reference:

- Prem S. Mann and Christopher J. Lacke, Introductory Statistics, 7th edition, Willey, 2010.

Kingdom of Saudi Arabia

Ministry of Higher Education

Majmaah University

College of Engineering

COURSE SPECIFICATION

14 December 2015

Course Specification

Majmaah University
College of Engineering / Basic Engineering Sciences Department

A. Course Identification and General Information

1. Course title and code: General Physics PHY 103
2. Credit hours: 4
3. Program(s) in which the course is offered: In all engineering programs
4. Name of faculty member responsible for the course: **Dr. Ahmed Mohammed Ismail**
5. Year at which this course is offered: Sophomore/second year
6. Pre-requisites for this course: none
7. Co-requisites for this course: none
8. Location if not on main campus: main campus

B. Objectives

1. Summary of the main learning outcomes for students enrolled in the course.

The goal of this course is to provide the student with fundamentals and basic physical concepts which directly related to the engineering sciences. the main learning outcomes for students includes :

- **Distinguish between different wave motions like sound and light.**
- **Employing wave equations in different applications.**
- **Application of thermodynamics relations on some physical concepts.**
- **Identification of the properties of light and its applications.**
- **Constructing an electric circuit using basic circuit elements.**
- **Training on the correct method for thinking and solving simple and complicated problems.**

2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field)

- **Continuous updating of the information, knowledge and skills included in the course through continuous search for new knowledge and skills available in recent publications (references, books, researches, magazines, internet….).**
- **Verifying the information resources.**
- **Continuous evaluation of the course content, student level, and develop plans accordingly.**

C. *Course Description* *(Note: General description in the form to be used for the Bulletin or Handbook should be attached)*

1. Topics to be Covered

List of Topics	No of Weeks	Contact hours
Wave Motion: Propagation of a Disturbance, Traveling Wave, The Speed of Waves on Strings, Reflection and Transmission, Rate of Energy Transfer by Sinusoidal Waves on Strings, The Linear Wave Equation.	**2**	**6**

Sound Waves: Pressure Variations in Sound Waves, Speed of Sound Waves, Intensity of Periodic Sound Waves, The Doppler Effect.	**2**	**6**
The Nature of Light and the Principles of Ray Optics: The Nature of Light, Measurements of the Speed of Light, The Ray Approximation in Ray Optics, Wave Under Reflection, Wave Under Refraction, Total Internal Reflection.	**1**	**3**
Wave Optics: Young's Double-Slit Experiment, Waves in Interference, Intensity Distribution of the Double-Slit Interference Pattern, Change of Phase Due to Reflection, Interference in Thin Films.	**2**	**6**
Diffraction Patterns and Polarization: Diffraction Patterns from Narrow Slits, The Diffraction Grating, Polarization of Light Waves.	**1**	**3**
Thermodynamics: Temperature, Thermometers and the Celsius Temperature Scale, The Constant-Volume Gas Thermometer and the Absolute Temperature Scale, Thermal Expansion of Solids and Liquids, Macroscopic Description of an Ideal Gas.	**1**	**3**
The First Law of Thermodynamics: Heat and Internal Energy, Specific Heat and Calorimetry, Latent Heat, Work and Heat in Thermodynamic Processes, The First Law of Thermodynamics, Some Applications of the First Law of Thermodynamics.	**2**	**6**
Current and Resistance: Electric Current, Resistance, A Model for Electrical Conduction, Resistance and Temperature, Superconductors, Electrical Power.	**1**	**3**
Direct-Current Circuits: Electromotive Force , Resistors in Series and Parallel, Kirchhoff's Rules, *RC* Circuits, Household Wiring and Electrical Safety.	**2**	**6**

2. Course components (total contact hours per semester):				
Lecture: **45**	Tutorial: **16**	Laboratory: **32**	Practical/Field work/Internship	Other: **Office hours 64 hours (4 hours per week)**

3. Additional private study/learning hours expected for students per week. (This should be an average for the semester not a specific requirement in each week)

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. Knowledge

(i) Description of the knowledge to be acquired

- **Knowing the different scales and measurements of heat.**
- **Learning the basic concepts of thermodynamics.**
- **Mastering the nature of waves and its properties.**
- **Learning the basic concepts that describe sound waves.**
- **Understanding the nature of light and its properties.**
- **Learning the basic concepts of electric circuits.**
- **Knowing basic Electric circuit elements.**

(ii) Teaching strategies to be used to develop that knowledge

- **Lectures using power point presentations, smart board, and projectors.**
- **Discussions.**
- **Handout of lecture notes for each topic.**

(iii) Methods of assessment of knowledge acquired

- **Continuous feedback, oral.**
- **Quizzes.**
- **Midterm exams and final exam.**

b. Cognitive Skills

(i) Description of cognitive skills to be developed

- **Each student is expected to prepare a topic related to the course and present it for the whole class.**
- **Frequent assignments during the term.**

(ii) Teaching strategies to be used to develop these cognitive skills

- **Topics are to be selected by the lecturer, then to be distributed for the students, and each student is to prepare the material for each topic and to present it for the whole class.**
- **Students are required to deliver a summary for some topics related to the course.**

(iii) Methods of assessment of students cognitive skills

- **Evaluation of the topics prepared by students according to the content, arrangement, and covering of the topic.**
- **Evaluation of the student presentation according to certain criteria.**
- **Evaluation of the student preparations.**

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

- **Students are expected to develop certain team work activities regarding the theoretical part.**

- **Students are distributed into groups in the physics lab, each group has to work in harmony and has certain responsibilities.**

(ii) Teaching strategies to be used to develop these skills and abilities

- **Part of some lectures will be specified for group discussions. At least students will be distributed into groups once monthly for discussing certain issues in the theoretical part.**
- **Students will undergo physics experiments as groups in the physics lab.**

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- **Observe students during their interactions and discuss with them their point of view regarding the issues under discussion.**
- **Evaluating students interactions in the lab as well as in the classroom.**

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain.

- **Encourage students to use internet for searching certain electronic journals regarding topics of the course.**
- **Students are required to prepare and present subjects using different educational strategies (power point presentations, …..)**.

(ii) Teaching strategies to be used to develop these skills

- **Students will be asked for delivering a summary regarding certain topics related to the course.**
- **Each student is expected to prepare and present one issue regarding to the course for about 15 minutes.**
- **At the end of each week, students are to submit a log regarding their practice in that week.**

(iii) Methods of assessment of students numerical and communication skills

- **Part of the grade is put for students written participations.**
- **About 10 grades are put for the presentation (written and way of presentation)**
- **Each log delivered by the student will be objectively evaluated.**

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required

- **Students are expected to measure different physical quantities related to the course.**
- **Students are expected to prepare small useful projects related to the course.**

(ii) Teaching strategies to be used to develop these skills

All skills that are required from the student will be performed for the student in the lab.

(iii) Methods of assessment of students psychomotor skills

Part of the final evaluation will be performed by the supervisor in the physics lab.

5. Development of Learning Outcomes in Domains of

Assessment	Assessment task (e.g. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	**First Midterm exam**	**7**	**20**
2	**Second Midterm exam**	**13**	**20**

3	**Lab**	**During the term**	**10**
4	**Exercises**	**During the term**	**5**
5	**Quizzes**	**During the term**	**5**
6	**Final written exam**	**End of semester**	**40**

D. Student Support

1. Arrangements for availability of teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week) **Two office hours per day for student consultations and academic advice.**

E. Learning Resources

1. Required Text(s) **Physics for Scientists and Engineers, Raymond A. Serway and John W. Jewett, Thomson Brooks/Cole © 2010; 8th Edition.**
2. Essential References **Fundamental of Physics by Halliday & Resnick, John Wiley & Sons, 2008.**

3. Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)

Schaum's Outline of College Physics, F. J. Bueche and E. Hechet, McGraw-Hill,1997.

4. Electronic Materials, Web Sites etc

http://science.pppst.com/physics.html

http://physwiki.ucdavis.edu

http://www.physics.org

http://www.physicsclassroom.com/

http://www.phys4arab.net/

5. Other learning material such as computer-based programs/CD, professional standards/regulations

- **Crocodile Physics: a powerful simulator that lets you model a range of electricity, motion and forces, optics and waves.**
- **Electronic Work Bench: is used for circuit simulation in electronics labs. The software allows the students to quickly verify the operation of an analog or digital electronic circuits.**

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)
   - **Lecture rooms.**
   - **Physics laboratory.**

2. Computing resources

- **One computer in the Lecture rooms, and another in the lab.**
- **Smart board. (In both Lecture rooms and lab)**
- **Data show. (In both Lecture rooms and lab)**

3. Other resources (specify -eg. If specific laboratory equipment is required, list requirements or attach list)

G. Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- **Asking question before, during and after each lecture.**
- **Perform a quiz after each unit.**
- **The exams and student participations.**

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

Oral and written questions and questioner forms.

3. Processes for Improvement of Teaching

- **Continuous updating of the course content.**
- **Looking for more clarifying examples.**
- **Continuous assessment of student's acquiring of knowledge and skills**.

4.	Processes for Verifying Standards of Student Achievement (eg. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **Discussion of the course objectives, teaching strategies, exams, students learning abilities and achievements, with another colleague in the same field.**
5.	Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **Continuous evaluation of the students during the term, and frequent updating of the course content.**

Attachment 2(f)

Guidelines on Using the Template for a Course Specification

Descriptions of what should be included in program and course specifications and in the annual and periodic reports are included in Section 2.4 of Part 2 of this *Handbook*

Institution, College/Department	Show the name of the institution and the college or department principally responsible for the course.
A. Course Identification and General Information	
1. Course title and code	Show the title and the institutional code number for the course.
2. Credit hours	Write the number of credit hours for the course.
3. Program(s) in which the course is offered	Write the name of the program in which the course is offered. A course may be offered in more than one program and a brief explanation may be needed to show how it relates to those programs. As a guide, if a course is an important component of several programs, list these programs. If it is used as a general skills course or a service course for a number of programs this should be noted and an indication given of the fields that are supported by it. (A first year course in mathematics might be an example of this.) If the course is a general elective which could be taken in many different programs this should be noted but those programs would not be listed.
4. Name of faculty member responsible for the course	If a single member of teaching staff has been given responsibility for teaching and reporting on the delivery of a course that persons name should be given. If a team of staff teach the course and one person has been given coordinating responsibility that persons name should be shown. If it is a new course for which an instructor has not yet been appointed that should be noted and the new appointees name included when it is known.
5. Level/year at which the course is offered	Show the year level when the course is intended to be taken.

6. Pre-requisites for this course	List any courses or other requirements that are prerequisites for enrolling in the course.
7. Co-requisites for this course	List any courses or other experiences that must be taken concurrently with this course.
8. Location if not on main campus	If the course is offered in a different location such as an industry setting or in another city or township indicate where this is done.

B. Objectives	
1. Summary of main learning outcomes.	This is intended as a brief statement of the main learning outcomes of the course. Detailed learning outcomes in domains of learning are shown in the next section.
2. Course development plans	Briefly describe any plans for developments or changes in the course such as changes in use of web based material, new techniques of instruction, changes in content or increased reliance on students self study or use of library resources. The description should include the reason(s) for the changes being made.
C. Course Description	
The general course description set out in the Handbook or Bulletin should be attached.	
1. Topics to be Covered	Complete the table to indicate the amount of time and the total number of contact hours intended to be given for each topic in the course. If part of a week is allocated for a particular topic use decimals to indicate time fraction. (For example a particular topic may be planned for 2.5 or 3.5 weeks).
2. Course Components	Indicate the total contact hours intended to be given in each organizational arrangement—Lecture, tutorial, laboratory etc.
3. Additional Private Study or Learning Hours	Indicate the amount of time expected of students in private study, assignment or other work associated with the course This should be shown as an average amount of time per week over the semester.

4. Development of Learning Outcomes in Domains of Learning	In this item summarize the learning outcomes expected from the course in each of the domains of learning, the teaching strategies to be used to develop that learning and the way student learning will be assessed. Note that every course is not expected to contribute to every domain. However wherever it is feasible to do so courses should be designed to contribute to the development of skills such as effective group participation, capacity for independent learning, communication skills, and problem solving abilities. The description of teaching strategies requires more than a specification of the organizational arrangement shown under C 2 and should indicate what will be done within those arrangements to develop the kind of learning sought.
a. Knowledge	
(i) Knowledge to be acquired	This should be a list of topics or areas of knowledge that students should know and understand when they complete the course.
(ii) Teaching strategies	Explain what strategies will be used to develop students' knowledge and understanding. *Example—Lectures, tutorials and independent study assignments. Introductory lecture gives an overview of the content and significance of the course and of its relationship to students' existing knowledge. Each subsequent lecture begins with a similar overview linking the particular content of the presentation to the general overview. Tutorials review the content of each lecture and clarify any matters not understood. Individual assignments require use of library reference material and web sites to identify information required to complete tasks.*
(iii) Methods of assessment	Explain how acquisition of knowledge will be assessed. *Example--15 minute multiple choice test on content on completion of each topic with results carrying 20% of final assessment. Multiple choice knowledge item on final exam.*
(b) Cognitive Skills	
(i) Cognitive skills to be developed	List the thinking and problem solving skills the course is intended to develop. As a guide it may be useful to begin with the phrase "The ability to…." The list should include both the use of analytic and predictive formulae and conceptual tools when asked to do so, and the ability to identify and use ones that are appropriate for new and unanticipated problems.

(ii) Teaching strategies	Explain techniques to be used to teach and encourage appropriate use of cognitive skills. *Example—Explanations and examples given in lectures and practiced under supervision in tutorials and laboratory tasks. Transfer of learning encouraged by use of analytical tools in different applications and through discussion of potential application in other areas. Assignment tasks include some open ended tasks designed to apply predictive, analytical and problem solving skills (Eg. What would happen if……..?, How could……?)*
(iii) Methods of assessment	Explain method of assessment for cognitive skills. *Example—Problem solving questions carrying 50% of mark on tests given at the end of each topic and on end of semester examination. Group and individual assignments require application of analytical tools in problem solving tasks.*
(c) Interpersonal Skills and Responsibility	
(i) Skills to be developed	List the objectives of this course for improving students' interpersonal skills, capacity for self directed learning, and personal and social responsibility.
(ii) Teaching strategies	Explain what will be done in the course to develop students' interpersonal skills, personal and social responsibility, and capacity for independent learning. *Example—One group assignment in which 25% of assessment is based on individuals contribution to the group task. (Instructor meets with each group part way through project to discuss and advise on approach to the task) Two individual assignments requiring investigation using internet and library resources as a means of developing self study skills. Role play exercise on controversial issue relevant to the course based on a case study, with discussion in tutorial of appropriate responses and consequences to individuals involved.*
(iii) Methods of assessment	Explain how interpersonal skills and responsibility will be assessed. *Example—Assessment of group assignment includes component for individual contribution. Capacity for independent study assessed in individual assignments.*

(d) Communication Information Technology and Numerical Skills	
(i) Skills to be developed	Indicate the contribution of this course to students' communication, IT and numerical skills. Note that what is intended in this section is the development of generic skills for all students rather than specialized studies relevant to a field of study that would be included under items a. or b. For example a course in history or philosophy might include some use of basic mathematical or statistical information and the use of ICT in searching for information and presenting reports. A course in computer science might include the ability to present written reports that develop language ability.
(ii) Teaching strategies	Explain what will be done in the course to develop students' numerical and communication skills. *Example—Student assignments require good standards of use of ICT. Where standards are inadequate the student is referred for special remedial instruction. Student essay assignments require proper style and referencing format as specified in college style manual.*
(iii) Methods of assessment	Explain how numerical and communication skills will be assessed in this course. *Example—Test questions require interpretation of simple statistical information. Assessments of students assignment and project work include expectation of adequate use of numerical and communication skills. Five percent of marks allocated for standard of presentation using ICT.*
(e) Psychomotor Skills	
(i) Skills to be developed	Indicate any psychomotor skills the course is intended to develop and describe the standard to be achieved.
(ii) Teaching strategies	Explain processes to be used to develop required psychomotor skills as specified in course learning outcomes.
(iii) Methods of assessment	Explain how psychomotor skills will be assessed.

6. Schedule of Assessment Tasks	Complete the table to show the dates planned for each assessment task and the proportion of the final assessment allocated for that task.

D. Student Support	
1. Availability of teaching staff for consultations and advice.	Describe the arrangements to be made for individual student counseling and advice. This should include the time allocation and schedule for teaching staff to meet with students.

E Learning Resources	
1. Required Texts	List any required texts.
2. Essential References	List reference material regarded as essential for teaching the course.
3. Recommended Books and Reference Material	Attach list of material that should be available for reference by students undertaking the course.
4. Electronic Materials	List requirements for access to electronic materials, data bases etc.
5. Other Materials	List any other learning materials that are required for the course

F. Facilities Required	
1. Accommodation	Specify accommodation requirements for delivery of the course indicating the type of facility (eg lecture rooms, laboratories etc. the amount of time needed, any special requirements for scheduling, and the number of students to be accommodated.
2. Computing resources	Specify requirements for computer access.
3. Other Resources	Specify any other requirements for the course including specialized equipment. Attach list if necessary.

G. Course Evaluation and Improvement Processes	
1. Strategies for Obtaining Student Feedback on Quality of Teaching	Describe strategies. Eg. confidential completion of standard course evaluation questionnaire. Focus group discussion with small groups of students.

2. Other Strategies for Evaluation of Teaching	Describe any other strategies for evaluation of teaching. Eg. observations and assistance from colleagues, independent assessment of standards achieved by students, independent advice on assignment tasks, etc.
3. Processes for Improvement of Teaching	Describe processes for improvement of teaching. Eg. Workshops on teaching methods, review of recommended teaching strategies.
4. Processes for Verifying Standards of Student Achievement	Describe methods used to compare standards of achievement with standards achieved elsewhere. Eg. check marking of a sample of examination papers or assignment tasks,
5. Action Planning for Improvement	Describe process for reviewing feedback on the quality of the course and planning for improvement