SCHOOL OF STEM SYLLABUS

TERM:

INSTRUCTOR:

COURSE CODE: CNM-120

OFFICE HOURS:

COURSE TITLE: Introduction to Engineering Science and Calculations

OFFICE LOCATION:

DAY(S) AND TIME(S):

EMAIL:

LOCATION:

PHONE:

COURSE PREREQUISITE: None

CREDITS: 4

COURSE DESCRIPTION:
This is a preparatory class for the students who intend to pursue a career in Construction Management or in the field of Civil Engineering. This course develops an understanding of the science and mathematics involved in engineering. Students learn to perform mathematical calculations used in construction and project management. Students analyze physical laws and how to apply that analysis in engineering fields.

STUDENT LEARNING OUTCOMES:
Upon successful course completion, student

- Demonstrate an understanding of basic scientific concepts applicable to engineering problems.
- Analyze and interpret data applicable to an engineering problem.
- Calculate numerical/engineering problems with precision and accuracy.
- Apply critical thinking/quantitative reasoning to engineering projects.
- Identify health, safety, and environmental regulation requirements at an engineering site

TEXTBOOK AND SUPPLEMENTAL MATERIALS:

Instructor will provide access to open source material.

Additional Student Resources
Students are encouraged to use the library resources and external resources to support the coursework.

1. College Physics by Serway/Faughn 10th Edition; ISBN-13 9781285737027
2. Foundation of College Chemistry/ Edition 14; ISBN-13 2901118298236

Other supplementary resources

Following links are helpful in getting material help for the coursework.

www.CfE_CourseUnitSupportNotes_N4_Technologies_EngineeringScience.pdf

http://www.unitconverters.net/

https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-measurement-topic/cc-5th-unit-conversion/e/converting-units

http://www.physicsclassroom.com/

GRADING POLICY:

Attendance and Participation	**5%**
Assignments	**35%**
Midterm	**30%**
Final Exam	**30%**

SAMPLE COURSE SCHEDULE:

Schedule	**Lecture Topic**	Student Learning Objectives (SLO)
Session 1	Orientation, description of course content, purpose, and schedule. **Scientific Data & its Presentation** 1. Introduction to common laws of science & their application in daily life. 2. Elements of data (constants, variables, dependent variable, hypothesis results, graphs, charts). 3. Different ways of data presentation and interpretation of data (graphs and chart, model, precision, model). 4. Common unit conversions. 5. Statistical terms; mean mode, median, standard deviation, probability, normal distribution, graphical representation,	SLO 1,2

Session 2	**Bridge Engineering & Science** 1. Concurrent forces on a plane, concept of engineering mechanics, rigid body. 2. Force, and reaction applied to structures. 3. Rotational forces. 4. Supports, type of supports, type of reactions. 5. Centroid and center of gravity of structures. 6. Concept of simple machines (modify forces). 7. Stress and strain in structures. 8. Moment of Inertia of plane figure with respect to an axis in its plane, **Problems related to topic; Assignment No. 1**	SLO 1,3,4
Session 3	**Materials used in Bridge Construction & their Engineering Characteristics** **1.** Properties of materials have application in construction (wood, steel, and concrete). **2.** Mechanical & Physical Properties. **3.** Classification of material according to nature of deformation. **4.** Shear stress, tension and deformation. **5.** Elastic and plastic behavior of material. **6.** Torsion (generators-turbines, circular and hollow shafts, deformation in shafts). **7.** Safety factors. **8.** Behavior of different materials under loading conditions, Stress-Strain Curve, ductile and brittle material **9. Problems related to topic; Assignment No. 2**	SLO 1,3,4
Session 4	**Elementary Statics & Dynamics**	SLO 3,4

	1. Free body diagrams. 2. Types of loading. 3. Static and dynamic loading, Friction, types of frictions, static friction, dynamics friction, coefficient of friction, angle of friction, angle of friction, angle of repose. Wedge friction, simple friction problems based on sliding of block on horizontal and inclined plane and wedge friction and other forces. 4. Resolution of forces, equilibrium of collinear forces, super position, and transmissibility, Composition of forces, parallelogram law, Equilibrium of concurrent forces: Lami's theorem, method of projection, equilibrium of three forces in a plane. 5. **Problems related to topic; Assignment No. 3**	
Session 5	**Fluid Properties** 1. Properties of fluids. 2. Classification of fluids, Ideal and non-ideal fluids viscosity, surface tension. 3. Hydraulics, difference between hydraulics and fluid mechanics, capillarity, Pressure measurement devices, monometer, Piezometer. 4. Drainage, and venting systems **Problems related to topic; Assignment No. 4**	SLO 1,2,3,4
Session 6	**Heat Impact on Bridge Structures** 1. Insulators, conductors. 2. Different types of conductors and insulators, types of circuits. 3. Expansion, and contraction of materials (wood, concrete, and steel) due to change in temperature. 4. Linear and volumetric expansions in decks and bearings. 5. Behavior of different materials under variable weather conditions. 6. Provision of expansion and contraction joints.	SLO 1,3,4

Session 7	**Bridge Electrical Systems** 1. Basic laws of electricity. 2. Types of conduits and their sizing and installation. 3. Types of electrical circuits used in a bridge structure. 4. Temperature impact on conductors. 5. AC & DC Current. 6. Power supply. **Problems related to topic; Assignment No. 5**	SLO 1,3,4
Session 8	**Midterm Examination**	SLO 1,2,3,4,5
Session 9	Review Midterm Exam **Suggested Lecture Topics for Session 9:** 1. Moveable bridges (Type of bridges) 2. Bridge super structure, substructure (pier), and abutment 3. How bridge moves (inertial force required to move a huge mass, accelerate, decelerate and stopping force, braking phenomena 4. Balancing forces 5. Simple machines, lever, pulleys, inclined planes, wedges, movement on inclined planes friction **Problems related to topic; Assignment No. 6**	SLO 1,3
Session 10	**Electrical/Mechanical Components of Bridges** 1. Control House 2. Motors (Types of motors), gear, rack, pinion, shafts, bearings, chain, hoist and elevators, counterweight ropes, 3. Generators, compressors, condensers, pumps 4. Signals, traffic lights	SLO 1,2,4

	5. Termination and grounding of conductors 6. Hydraulic Machines 7. HVAC System (transfer of heat energy, radiation theory) 8. Fire Alarm & Protection System (sprinkler system)	
Session 11	**Engineering Chemistry I** 1. Chemistry of engineering materials and environment 2. Heat of hydration in concrete 3. Chemical composition of engineering material 4. Chemistry of special materials used in construction. 5. Hardness of water, PH value, acidity, alkalinity, **Problems related to topic; Assignment No. 7**	SLO 1,3,4
Session 12	**Engineering Chemistry II** 1. Chemistry of concrete 2. Types of corrosion and preventive measures 3. Asphaltic material and their chemical composition, other adhesives, and lubricants	SLO 1,3,4
Session 13	**Traffic Engineering Studies** 1. Traffic Signs, signals and streetlights, pavement markings, roadway geometry, 2. Roadway Users 3. Vehicular traffic, DHV, AADT 4. Pedestrians traffic 5. Daily traffic, Annual daily traffic, Peak hour, peak hour factors, types of signals, signal cycle 6. Parking studies, stalls, demand, and supply **Problems related to topic; Assignment No. 8**	SLO 1,4

Session 14	**Environmental Issues** 1. Air Pollution 2. Water Pollution 3. Solid Waste Management 4. Handling of hazardous material	SLO 1,5
Session 15	Final Test	SLO 1,2,3,4,5

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https://www.hccc.edu/administration/academic-affairs/syllabus-addendum.html