APPLIED MECHANICS I (STATICS)
BEG 156 CI

Year: I **Semester II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	**Tutorial**	**practical**	**Internal Assessment**		**Final**		**Total**
3	**2**		**Theory**	**Practical**	**Theory**	**Practical**	**100**
			20	**-**	**80**	**0**	

Course Objective/s:
After the completion of the course, students will be able to design, construct, supervise repair and maintain the roads. They will be familiar with the traffic design, control and operation. The course provides glimpses on the bridge and tunnel as well.

1.0 Introduction **(3 Hrs)**
- 1.1 Definition and scope of mechanics, engineering mechanics and static
- 1.2 Concept of partice,rigid body, deformed & fluid bodies
- 1.3 Equations of static equilibrium in 2D & 3D
- 1.4 Free body diagram(definition, importance and example)
- 1.5 System of units

2.0 Vector **(5 Hrs)**
- 2.1 Introduction (vector and scalar quantities ,simple operation of vectors and their laws ,position vectors)
- 2.2 Unit vector in Cartesian coordinates
- 2.3 Dot products (definition ,laws and applications)
- 2.4 Cross products (definition ,laws and applications)
- 2.5 Scalar and Vector triple products

3.0 Forces **(7 Hrs)**
- 3.1 Definition and principle of forces
- 3.2 Types of Forces (coplanar,coolinear,concurrent,parallel,external and internal forces)
- 3.3 Principle of Transmissibility and its limitations
- 3.4 Resolution and composition of forces
- 3.5 Lami's theorem , variagnon's theorem,triangle,parallelogram and polygon law of forces ,momentum forces about a point and axis (in scalar and vector form)
- 3.6 Definition of couple prove it as free vector
- 3.7 Resolution of forces into forces and a couple and a vice versa
- 3.8 Resultant of system of forces (wrench , parallel,concurrent,coplanar and general)

4.0 Distributed force **(5 Hrs)**
- 4.1 Definition and derivation of center of gravity and centroid (composite figure and direct integration method)
- 4.2 Centroid of lines ,areas and volumes
- 4.3 Definition of second moment of area (moment of inertia) and radius of gyration
- 4.4 Parallel and perpendicular axis theorem, MOI of common figures (e.g. Rectangle,triangle,circle and ellipse) and uniform thin rod

4.5 MOI of built up section
4.6 MOI by direct integration method

5.0 Friction (4 Hrs)

5.1 Introduction (definition, types ,cause and defect)
5.2 Laws of dry friction
5.3 Static friction ,coefficient of friction and angle of friction
5.4 Condition of sliding and tipping
5.5 Application of static problems

6.0 Introduction of Structures (5 Hrs)

6.1 Structural components (beam,truss,frame,2D plate,cable,arch,grid)
6.2 Difference between plane and space structures
6.3 Difference between mechanism and structures
6.4 Types of loading and supports
6.5 Determinacy (internal and external) and stability (statical and geometrical) [General concept]

7.0 Introduction of analysis of beam (6 Hrs)

7.1 Definition and types of beam
7.2 External and internal forces in beam
7.3 Definition and sign convention of Axial forces ,shear forces and bending moment
7.4 Relation and between load ,shear force and bending moment
7.5 Axial force,shear force and bending moment diagram

8.0 Introduction and analysis of Frame (4 Hrs)

8.1 Definition and type of frame (rigid ,deficient, redundant)
8.2 Determinacy and stability
8.3 Axial force ,shear force and bending moment diagram

9.0 Introduction to Analysis of plane truss (4 Hrs)

9.1 Definition and types (according to support condition purpose of utilization ,degree of complexity)
9.2 Determinacy and stability
9.3 Analysis of truss (methods of joints and method of section)\

10.0 Introduction of Space truss (2 Hrs)

10.1 Definition
10.2 Tension coefficient ,shear leg ,tripods
10.3 Analysis of simple space truss

Recommended books:

1. **"Engineering Mechanics-Statics and Dynamics** Shames ,I.H,3rd ed., **New Delhi,**
2. **Prentice Hall of India ,1990.**
3. **"Mechanics of Engineers-Statics and dynamics" F.P.Beer and E.R.Johnston,JR 4th Edition,Mcgrw-Hill,1987**

COMPUTER CONCEPT AND PROGRAMMING
BEG174CO

Year: I **Semester: I**

Teaching Schedule Hours/week			Examination Scheme						Total Marks	Remarks
			Final				Internal Assessments			
			Theory		Practical		Theory Marks	Practical Marks		
L	T	P	Duration	Marks	Duration	Marks				
3	1	3	3	80			20	25	125	

Course Description: This course deals with the fundamental concept of computers and programming language. Working with some basic software will be taught in this course. The use of computer in civil engineering will be explained through programming.

Course objective: By the end of this course:

- ✓ Use and operates computers
- ✓ Enhance knowledge about computers
- ✓ Work under different operating system
- ✓ Work with word processor and spreadsheets
- ✓ Develop simple code in C-programming language

1-Computers and Introduction **3 Hrs**

1.1 History of Computer
1.2 Type of computer
1.3 Generation of Computer
1.4 Uses: General purpose and Specific purpose
1.5 Comparison between Man and Computer

2-Computer System **4Hrs**

2.1. Input unit, CPU, Output unit
2.2. CPU: Primary storage, Control Unit
2.3. RAM, DRAM, SDRAM, ROM, EPROM, PROM
2.4. Hard Disk, Printer and Keyboard

3-Number System **4Hrs**

3.1. Decimal System
3.2. Binary System
3.3. Octal System
3.4. Hexadecimal System
3.5. Conversion of one system to another
3.6. Bits, Nibble , Bytes and words

4-Operating System **3Hrs**

4.1. Definition of operating system
4.2. Functions of operating system
4.3. Types of operating system

5-Computers Media **3 Hrs**

5.1. Magnetics Tape
5.2. Floppy Disc
5.3. Hard Disk
5.4. Computer Peripherals
5.5. Sound System

6-Software Applications **10 Hrs**

6.1. Word Processor
6.2. Spreadsheet
6.3. Database
6.4. Graphics
6.5. Engineering applications

7-Programming Language **6 Hrs**

7.1. Introduction and History of C- Language
7.2. Different steps in problem solving
7.3. Writing Simple C program

8. **Writing program in C** **12 Hrs**

8.1. Introduction to function Introduction to Array
8.2. Classes of Structures and Pointer

CHEMISTRY
BEG104SH

Year: I **Semester: I**

Teaching Schedule Hours/week			Examination Scheme						Total Marks	Remarks
			Final				Internal Assessments			
			Theory		Practical		Theory Marks	Practical Marks		
L	T	P	Duration	Marks	Duration	Marks				
3	1	2	3	80			20	25	125	

Course Description: This course on Chemistry deals with some advanced topics practical that have we in Civil Engineering. The course syllabus has been divided into three part first part deals with physical chemistry. Second and third part respectively deals with inorganic and organic chemistry.

Catalogue Description: Atomic Structure, Chemical Bonding, Electro chemistry, Transition. Elements, Types of organic Reaction, stereo chemistry, polymers and polymerization.

Course objective: By the end of this course, students will be able to

- Enhance their knowledge in physical, inorganic and organic chemistry
- Acquire knowledge on Environmental Chemistry
- Know the types of organic reactions
- Understand Polymers and polymerization

1. **Atomic structure** **7 Hrs**
   - 1.1.Diffraction concept
   - 1.2.Schrodingers wave equation
   - 1.3.Quantum number
   - 1.4.Afubau principle
   - 1.5.Pauil's exclusion principle
   - 1.6.Stability of noble gases
2. **Chemical bonding** **6 Hrs**
   - 2.1.Electrovalent bond
   - 2.2.Metallic bond
   - 2.3.Crystal lattice
3. **Electro chemistry** **6 Hrs**
   - 3.1.Ostwald's dilution law
   - 3.2.Ph and ph scale
   - 3.3.Buffer and its functioning
   - 3.4.Electrolytic and galvanic cell
   - 3.5.Nernst equation
   - 3.6.Corrosion of metals

4. **Coordination complex 5 Hrs**
   4.1. Coronation compound
   4.2.Werner's coordination theory
   4.3.Nomenclature of coordination complex
   4.4.Electronic interpretation of coordination
   4.5.Valence bond theory
5. **Transition element 5 Hrs**
   5.1.Transition elements with periodic table
   5.2.Characteristic and properties of transition elements
   5.3.Complex formation and magnetic property and color compound
6. **Types of organic compound 6 Hrs**
   6.1.Substitution reaction
   6.2.Addition reaction
   6.3.Elimination reaction
   6.4.Rearrangement reaction
7. **Stereochemistry 3 Hrs**
   7.1.Optical and geometrical isomerism
   7.2.Racemic modification
8. **Organiometallic compound and explosives 3 Hrs**
   8.1.Preparation, prosperities and uses of Grignard reagent.
   8.2.Preparation , properties and action of explosive
9. **Polymer and polymerization 4 Hrs**
   9.1.Polymer and their type
   9.2.Synthetic and natural polymer
   9.3.Synthetic fibers

Laboratory Works:

1. To determine the alkalinity of the given sample of water (Two Labs).
2. To determine the total hardness of water sample.
3. To determine the permanent hardness of water sample.
4. To determine the amount of free chlorine in the given sample of water.
5. To determine the condition in which corrosion take place.
6 To measure the quantify of charge required to deposit one mole of copper.
7. To determine the iron from Mohr's copper.

References Books:

1. Selected topics in physical Chemistry- Motikaji Sthapit
2) Principles of physicals Chemistry_ Marron & prutto
3) Essentials of physical Chemistry_ Bahl & Tuli
4) Organic Chemistry - B. S. Bahl

Construction Materials
BEG159CI

Year: I **Semester: I**

Teaching Schedule Hours/week			Examination Scheme						Total Marks	Remarks
			Final				Internal Assessments			
			Theory		Practical		Theory Marks	Practical Marks		
L	T	P	Duration	Marks	Duration	Marks				
3	1	2/2	3	80	-	-	20	25	125	

Course Description:

This course deals with the fundamental concept of civil engineering related materials. The concept of this course is to provide the basic knowledge on the properties of materials and its use for the construction of any civil engineering related projects.

Course Contents:

1-Introduction 2.5 hrs

- ✓ Scope and Types of Construction Materials
- ✓ Properties of materials: Physical, Mechanical, Thermal and Electrical

2-Characteristics of construction materials 6.0 hrs

- ✓ Stress - Strain Relationships, modulus of Elasticity and Poisson's Ratio
- ✓ Comparative Stress-Strain curves for various engineering materials
- ✓ Stress-Strain diagram for ductile metal
- ✓ Griffith's theory for brittle fracture
- ✓ Principles of hardness and impact tests of engineering materials

3-Basic Construction Materials 3.0 hrs

- ✓ Sieve analysis
- ✓ Stone, its types and Properties
- ✓ Aggregate (fine and coarse), their quality
- ✓ Bulking of Sand

4-Metals and its microstructure study 8.0 hrs

- ✓ Categorization of metals : Steel, Aluminium, Cast Iron
- ✓ Formation, composition and Characteristics of cast iron, wrought iron, steel, aluminium and alloys and their uses
- ✓ Microstructure study of brittle and ductile metals/steel
- ✓ Elastic and Plastic behavior
- ✓ Hardness and toughness
- ✓ Ductility and resilience
- ✓ Other mechanical properties (i.e. brittleness, malleability, stiffness, tenacity, creep, fatigue, wear resistance etc)
- ✓ Deformation of steel
- ✓ Heat treatment of steel and its thermal properties

- ✓ Fracture modes of materials
- ✓ Steel corrosion and its treatment

5-Wood **6.0 hrs**

- ✓ Types of wood
- ✓ Bamboo as a construction material
- ✓ Tree structure and microstructure of wood
- ✓ Characteristics of soft and hard wood
- ✓ Properties of quality wood
- ✓ Advantages and disadvantages of wood over other construction materials
- ✓ Commercial forms of wood
- ✓ Mechanical and Thermal Properties
- ✓ Physical Properties (eg. defects & seasoning)

6- Properties of Ceramic Materials **6.0 hrs**

- ✓ Definition
- ✓ Types of ceramics (i.e., Traditional and new generation)
- ✓ Composition of brick, its harmful ingredients, qualities of good bricks
- ✓ Popular types of tiles and their uses, Roof Tiles, Floor Tiles, Wall Tiles
- ✓ Glass, its manufactory types, forms & common Properties

7- Cementing Materials **5.0 hrs**

- ✓ Clay
- ✓ Lime (composition, formation)
- ✓ Types and properties of lime
- ✓ Cement (composition, formation)
- ✓ Types and properties of cement
- ✓ Chemical reaction between lime and water, cement and water
- ✓ Testing of cement mortar and lime mortar

8- Properties of Asphalt materials **3.0 hrs**

- ✓ Asphalt, bitumen and tar
- ✓ Types of Asphalt cement, uses
- ✓ Introduction to asphalt concrete and properties

9- Synthetic Polymers **3.0 hrs**

- ✓ Definition
- ✓ Basic types (paints, varnishes, plastics)
- ✓ Properties of some polymers
- ✓ Use of polymers in repairs of structure

10-Miscellaneous Materials

- ✓ Rubber
- ✓ Adhesives
- ✓ Additives
- ✓ Abrasives
- ✓ Insulating Materials

Laboratories:

Seven Laboratories exercise will be performed in this course. These are:

1. Sieve analysis of clay, sand, gravel and crushed rock.
2. Hardness (Rockwell) tests on mild steel, alloy steel, aluminium alloy and cast iron.
3. Toughness (charpy) tests on mild steel, alloy steel, aluminium alloy and cast iron
4. Microstructure examination of mild steel, alloy steel, aluminium alloy, cast iron and wood using optical microscopes.
5. Tests to determine the linear coefficient of thermal expansion of aluminium, steel, wood, lime mortar, asphalt concrete and synthetic polymer
6. Setting time of cement
7. Microstructure examination of clay, lime mortar, cements mortar, asphalt concrete and one synthetic polymer.

Recommended Books:

1. "Fundamentals of Engineering Materials", Peter A. Thornton & Vito J. Colangelo, Prentice Hall Publishing company
2. "A text book of Material Science and Metallurgy, O.P. Khanna
3. Introduction to Engineering Materials, B.K. Agrawal
4. Engineering Materials, Gurucharan Singh

MATHEMATICS-I

BEG101SH

Year: I **Semester: I**

Teaching Schedule Hours/week			Examination Scheme						Total Marks	Remarks
			Final				Internal Assessments			
			Theory		Practical		Theory Marks	Practical Marks		
L	T	P	Duration	Marks	Duration	Marks				
3	3	-	3	80	-	-	20	-	100	

Objectives: The basic objective of the course is to provide a sound knowledge of calculates and other related topics.

1. **Limit and continuity of a function:……. 3hrs**
   Limit of a function with examples, infinity as a limit, continuity of a function with their Properties
2. **Derivatives: 5hrs**
   Derivatives of explicit, implicit, parametric equations, Derivative of hyperbolic and inverse hyperbolic functions, Higher order derivative and Leibnitz's Theorem, Partial derivatives of a function of two and three variables, and total differential coefficients.

3. **Application of derivatives: 10Hrs**
   Extrema of function of two and three variables, Mean value theorems Taylor and Maclauring's infinite series, indeterminate forms and L'Hospital rule Tangent and Normal, Curvature, Asymptotes, Curve Tracing (Cartesian, Parametric and Polar)
4. **Integration: 8Hrs**
   Basic integration formulae, Integration method, Standard integrals, Definite integral and its properties Definite integral as a limit of a sum, Fundamental Theorem of integral calculus, Improper integrals, Reduction formula for integrals Beta and Gamma functions

5. **Application of integral Calculus 7Hrs**
   Determination of area, length and volumes, Surface area of solid of revolution Double integrals of Cartesian curves.
6. **Plane Analytic Geometry: 6Hrs**
   Translation and rotation of axes, Circles, Parabola, Ellipse, Hyperbola
7. **Vector Algebra: 7Hrs**
   Vector Components, Types of vectors, Vector addition and subtraction, Direction cosines, Space coordinates (Cartesian, cylindrical and spherical) and equations relating to these co-ordinates. Scalar and vector product of two vectors, Product of Three vectors, Product of Four vectors, Vector equation of lines and planes