K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF CIVIL ENGINEERING

CO-PO MAPPING

Course: Elements of Civil Engineering and Mechanics			
Type: Core		Course Code: 21CIV24	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
3L	-	3	40
Marks			
Internal Assessment	Examination	Total	Credits
50	50	100	3

Aim/Objectives of the Course

- To make students learn the scope of various fields of civil engineering.
- To develop students' ability to analyze the problems involving forces, moments with their applications.
- To develop the student's ability to find out the center of gravity and moment of inertia and their applications.
- To make the students learn about kinematics and kinetics and their applications.

Course Learning Outcomes
After completing the course, the students will be able to

CO1	**Understand** and **explain** the various fields of civil engineering and the different building materials used.	**K3 Applying**
CO2	**Determine** the resultant and moment for a given force system subjected to various loads and **calculate** the friction, reactive forces and the effects that develop as a result of the external loads on rigid bodies.	**K3 Applying**
CO3	**Analyze** statically determinate beams and trusses (method of joints and sections).	**K4 Analyzing**
CO4	**Calculate** centroid and moment of inertia of regular and built-up sections.	**K3 Applying**
CO5	**Obtain** the relationship between motions of bodies.	**K3 Applying**

Syllabus Content

Module 1: Overview of Civil Engineering Systems: Introduction to structural engineering, geotechnical engineering, Construction technology, hydraulics, water resources and irrigation engineering transportation engineering, environmental and sanitary engineering, GIS, earthquake engineering. Role of civil engineers in the development of the nation. **Building materials:** Stone, brick, wood, glass, aluminum, cement, aggregates, concrete, steel, RCC, PSC, smart materials. **LO:** At the end of this session the student will be able to 1. List and explain the scope of different branches of civil engineering. 2. Explain the role of a civil engineer in the infrastructural development of a country.	**CO1** 8 hrs PO1-3 PO2-2 PO4-1 PO12 -1 PSO1-3 PSO2-1

3. List and explain the composition, manufacturing processes, properties and uses of various building materials used in construction.	
Module 2: Analysis of force systems: Concept of idealization, force, a system of forces, superposition, transmissibility, Resolution, and composition of forces, Law of Parallelogram of forces, polygonal law, Resultant of concurrent coplanar force system, coplanar non-concurrent force system, a moment of forces, couple, Varignons theorem, Resultant of coplanar non-concurrent force system, free body diagram, Lamis theorem, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force system. **Friction:** Types of friction, laws of friction, limiting friction, coefficient of friction concept of static and dynamic friction, numerical problems on impending motion on horizontal and inclined planes along with connected bodies. **LO:** At the end of this session the student will be able to 1. List and explain the basic idealizations in engineering mechanics. 2. Define force, force-system, moment, couple and resolve the given force systems. 3. Explain Newton's laws, principle of physical independence, superposition, transmissibility of forces, equivalent force - couple system. 4. State and prove Varignon's principle of moments. 5. Determine magnitude and direction of resultant of concurrent and non-concurrent system of forces. 6. Explain free body diagram and its importance, resultant, conditions of equilibrium and equilibrant. 7. State and prove Lami's theorem. 8. Explain types of friction, laws of friction, limiting friction, angle of friction, coefficient of friction and angle of repose. 9. Calculate friction developed between contact surfaces, force required to cause and stop impending motion in blocks on inclined planes, rope and pulley systems, ladder friction and wedge friction.	**CO2** 8 hrs. PO1-3 PO2-3 PO4-2 PO12-1 PSO1-3 PSO2-1
Module 3: Support reactions: Types of loads and types of supports, statically determinate and indeterminate beams, support reactions in beams, Numerical problems on support reactions for statically determinate beams (point load, udl, uniformly varying loads and moments) **Analysis of trusses:** Types of trusses, analysis of statically determinate trusses using the method of joints and method of sections. **LO:** At the end of this session the student will be able to 1. Explain the types of loads, supports and beams. 2. Determine the reactions developed at supports. 3. Analyze statically determinate truss by method of joints and method of sections.	**CO3** 8 hrs PO1-3 PO2-3 PO4-3 PO12-1 PSO1-3 PSO2-1
Module 4: Centroid: Introduction, methods of determining the centroid, locating the centroid of simple figures from first principle, the centroid of composite and built-up sections. **Moment of inertia:** Introduction, method of determining the second moment of area of plane sections from first principles, parallel axis theorem and perpendicular axis theorem section modulus, the radius of gyration, moment of inertia of composite area	**CO4** 8 hrs PO1-3 PO2-3

and built-up sections, concept of product of inertia (No problem). **LO:** At the end of this session the student will be able to 1. Explain the concepts of centroid and moment of inertia. 2. State and prove Parallel axis theorem and Perpendicular axis theorem. 3. Derive equation for determining centroid of regular geometric shapes. 4. Derive equation for determining moment of inertia of regular geometric shapes. 5. Locate the centroid and determine moment of inertia of regular and given sections.	PO4-3 PO12-1 PSO1-3 PSO2-1
Module 5: Kinematics: Displacement, average velocity, instantaneous velocity, speed, acceleration, average acceleration, variable acceleration, acceleration due to gravity, Newton's law of motion, rectilinear motion and numerical problems, curvilinear motion, super elevation, projectile motion, relative motion, numerical problems, motion under gravity, numerical problems Kinetics: D 'Alembert's principle and its application in-plane motion and connected bodies including pulleys. **LO:** At the end of this session the student will be able to 1. Define displacement, average velocity, instantaneous velocity, speed, acceleration, average acceleration, variable acceleration, acceleration due to gravity, rectilinear motion, curvilinear Motion, super elevation, projectile motion, relative motion. 2. Calculate average velocity, instantaneous velocity, speed, acceleration, average acceleration, variable acceleration, acceleration due to gravity, rectilinear motion, curvilinear motion, super elevation, projectile motion, and relative motion. 3. Explain D'Alemberts principle.	**CO5** 8 hrs PO1-3 PO2-3 PO4-3 PO12-1 PSO1-3 PSO2-1

Text Books

1. R.K. Bansal, **"A Text Book of Engineering Mechanics"**, Laxmi Publications.
2. R. C. Hibbler, **"Engineering Mechanics: Principles of Statics and Dynamics"**, Pearson Press.

Reference Books (specify minimum two foreign authors text books)

1. Andy and Rudra Pratap, Introduction to Statics and Dynamics, Oxford University Press.
2. F.P. Beer and E.R. Johnston, Mechanics of Engineers, Statics and Dynamics, McGraw Hill.
3. Irving H Shames, Engineering Mechanics, Prentice Hall.

Useful Websites

1. http://www.scirp.org/Journal/ojce/
2. http://www.springer.com/engineering/civil+engineering/journal/12205

Useful Journals

1. Journal of Engineering Mechanics (http://ascelibrary.org/journal/jenmdt)
2. Canadian Journal of Civil Engineering (http://www.nrcresearchpress.com/journal/cjce)

Teaching and Learning Methods

Lecture class: 40 hrs

Assessment

Type of test/examination: Written examination.

Continuous Internal Evaluation (CIE): 100 marks {60 marks (total of three tests, each of 20 marks) + 20 (two assignments, each of 10 marks) +20 (Quiz/Seminar. Group Discussion)}, which will be reduced to 50 marks.

Semester End Exam (SEE): 100 marks (students have to answer all main questions) which will be reduced to 50 marks.

Test duration: 1 hr

Examination duration: 3 hrs

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:**Environment and Society **PO8:**Ethics **PO9:**Individual & Team Work **PO10:** Communication **PO11:**Project Mngmt & Finance **PO12:**Lifelong Learning

PSO1: The proficiency in mathematics, physical and management sciences helps to excel in the areas of planning, analysis related to Civil Engineering systems.

PSO2: Identify sustainable materials and technologies, codes of practice in construction industry and transportation Systems.

CO	PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
21CIV 24	K-level														
CO1	K3	3	2	-	1	-	-	-	-	-	-	-	1	3	1
CO2	K3	3	3	-	3	-	-	-	-	-	-	-	1	3	1
CO3	K4	3	3	-	3	-	-	-	-	-	-	-	1	3	1
CO4	K3	3	3	-	3	-	-	-	-	-	-	-	1	3	1
CO5	K3	3	3	-	3	-	-		-	-	-	-	1	3	1

Course In charge

Head - Dept

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