FACULTY OF ENGINEERING

Scheme of Instruction & Examination

(AICTE Model Curriculum for the Academic Year 2019-2020)

and

Syllabi

B.E. III and IV Semester

of

Four Year Degree Programme

in

Civil Engineering

(With effect from the academic year 2019– 2020)

(As approved in the faculty meeting held on 25-06-2019)

Issued by

Dean, Faculty of Engineering

Osmania University, Hyderabad – 500 007

2019

SCHEME OF INSTRUCTION & EXAMINATION
B.E. (Civil Engineering) III – SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Courses										
1	MC112CE	Environmental Science	2	-	-	2	30	70	3	-
2	MC113PY	Essence of Indian Traditional Knowledge	2	-	-	2	30	70	3	-
3	MC204CE	Overview of Civil Engineering*	1	-	-	1	30	-	-	-
4	HS203MP	Industrial Psychology	3	-	-	3	30	70	3	3
5	BS206BZ	Biology for Engineers	3	-	-	3	30	70	3	3
6	ES211CE	Engineering Mechanics	2	1	-	3	30	70	3	3
7	ES213ME	Energy Sciences and Engineering	2	-	-	2	30	70	3	2
8	PC221CE	Solid Mechanics	3	-	-	3	30	70	3	3
9	PC222CE	Engineering Geology	2	-	-	2	30	70	3	2
10	PC223CE	Surveying and Geomatics	3	-	-	3	30	70	3	3
Practical/ Laboratory Courses										
11	PC251CE	Engineering Geology Lab	-	-	2	2	25	50	3	1
12	PC252CE	Surveying Lab	-	-	2	2	25	50	3	1
			23	**01**	**04**	**28**	**350**	**800**		**21**

HS: Humanities and Social Sciences BS: Basic Science ES: Engineering Science
MC: Mandatory Course PC: Professional Core
L: Lecture T: Tutorial P: Practical D: Drawing
CIE: Continuous Internal Evaluation SEE: Semester End Evaluation (Univ. Exam)
PY: Philosophy BZ: Biology/ Life Sciences CE: Civil Engineering
MP: Mechanical / Production Engineering ME: Mechanical Engineering.

Note:

1. Each contact hour is a clock hour
2. The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

3. All mentioned **Mandatory Courses** for BE (All Branches) should be offered either in I – Semester or II – Semester only **from the academic year 2019-2020**.
4. For those of the students admitted in BE (All Branches) during the academic year 2018-2019 the Mandatory Courses were not offered during the I – Semester or II – Semester may be compulsorily offered either in III – Semester or IV – Semester **for the academic year 2019-2020 only**.

* Mandatory Course for Civil Engineering Students only

Course Code	Course Title						Core/Elective
MC112CE	**Environmental Science**						**Mandatory**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	**-**

Course Objectives

- To create awareness and impart basic knowledge about the environment and its allied problems.
- To know the functions of ecosystems.
- To understand importance of biological diversity.
- To study different pollutions and their impact on environment.
- To know social and environment related issues and their preventive measures.

Course Outcomes

After completing this course, the student will be able to:

1. Adopt environmental ethics to attain sustainable development.
2. Develop an attitude of concern for the environment.
3. Conservation of natural resources and biological diversity.
4. Creating awareness of Green technologies for nation's security.
5. Imparts awareness for environmental laws and regulations.

UNIT-I

The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance, need for public awareness.

Natural Resources: Water Resources – Use and over utilization of surface and ground water, flood, drought, conflicts over water, Dams: Benefits and Problems. Food Resources –World Food Problems, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, Forest Resources –Use and over exploitation, deforestation & its effect on tribal people. Land Resources –Land Degradation, environmental effect of mining, man induced landslides, soil erosion and desertification**.** Energy Resources –Growing energy needs, Renewable and Non-renewable energy resources.

UNIT-II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in ecosystem, food chains, ecological pyramids, ecological succession, types of ecosystems (marine, pond, river, forest, grassland, desert)

UNIT-III

Biodiversity: Levels of Biodiversity, Bio-geographical classification of India, Value of biodiversity, Threats to biodiversity, endangered and endemic species of India, Conservation of biodiversity, global and national efforts.

UNIT-IV

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution, solid waste management.

Environment Protection Act: Air, water, forest and wildlife Acts, issues in the enforcement of environmental legislation.

UNIT-V

Social Issues and the Environment: Watershed management and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle and disaster management in India.

Field Work:

- Visit to a local area to document environmental issues- agricultural area/ pond/lake/terrestrial ecosystem
- Visit to a local polluted area- market/slum area/Industrial area/traffic area

Suggested Readings:

1. A.K. De, *Environmental Chemistry,* Wiley Eastern Ltd.
2. E.P. Odum, *Fundamentals of Ecology,* W.B. Sunders Co., USA.
3. M.N. Rao and A.K. Datta, *Waste Water Treatment,* Oxford and IBK Publications.
4. Benny Joseph, *Environmental Studies,* Tata McGraw Hill, 2005.
5. V.K. Sharma, *Disaster Management,* National Centre for Disaster Management, IIPE,1999.

Course Code	Course Title						Core/Elective
MC113PY	**Essence of Indian Traditional Knowledge**						**Mandatory**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	**-**

Course Objectives

The course will introduce the students to

- To get a knowledge in Indian Philosophical Foundations.
- To Know Indian Languages and Literature and the fine arts in India & Their Philosophy.
- To explore the Science and Scientists of Medieval and Modern India

Course Outcomes

After successful completion of the course the students will be able to

1. Understand philosophy of Indian culture.
2. Distinguish the Indian languages and literature among difference traditions.
3. Learn the philosophy of ancient, medieval and modern India.
4. Acquire the information about the fine arts in India.
5. Know the contribution of scientists of different eras.
6. The essence of Yogic Science for Inclusiveness of society.

UNIT – I

Introduction to Indian Philosophy: Basics of Indian Philosophy, culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian culture, Ancient Indian, Medieval India, Modern India.

UNIT – II

Indian Philosophy & Literature: Vedas Upanishads, schools of Vedanta, and other religion Philosophical Literature. Philosophical Ideas the role of Sanskrit, significance of scriptures to current society, Indian Philosophies, literature of south India.

Indian languages and Literature-II: Northern Indian languages & Philosophical & cultural & literature.

UNIT – III

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT – IV

Indian Fine Arts & Its Philosophy (Art, Technology & Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in Indian, development of science in ancient, medieval and modern Indian.

UNIT – V

Education System in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Scientists of Medieval India, Scientists of Modern India. The role Gurukulas in Education System, Value based Education.

Text Books:

1. Kapil Kapoor, “Text and Interpretation: The India Tradition’’, ISBN: 81246033375, 2005
2. “Science in Samskrit”, Samskrita Bharti Publisher, ISBN-13:978-8187276333,2007
3. NCERT, “Position paper on Arts, Music, Dance and Theatre’’, ISBN 81-7450-494-X, 2006
4. S. Narain, “Examination in Ancient India”, Arya Book Depot, 1993
5. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989
6. M. Hiriyanna, “Essentials of Indian Philosophy”, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990,2014
7. Chatterjee. S & Dutta “An Introduction to Indian Philosophy”

Course Code	Course Title						Core/Elective
MC204CE	**Overview of Civil Engineering**						**Mandatory**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**1**	**-**	**-**	**-**	**25**	**-**	**-**

Course Objectives

- To provide the understanding the fundamental concepts of Civil Engineering
- To provide an illustration of the significance of Civil Engineering Profession in satisfying societal needs.

Course Outcomes

After completing this course, the student will be able to:

1. Understand the relevance of civil engineering in the society & describe the uses of various construction materials
2. Explain the new technology/concepts of architecture in planning
3. Remember the basics of surveying, transportation and geotechnical systems
4. Remember the basics of environmental, water resources and structural engineering systems
5. Remember the various software used in the field of civil engineering

UNIT-I

Relevance of Civil Engineering: History of Civil Engineering- Introduction to various disciplines of civil engineering: Relevance of civil engineering in the overall infrastructure development of the country. Civil Engineering's global impact (social, economic, environmental) on the society.

Professional Ethics - Entrepreneurial possibilities in Civil Engineering.

Materials for Construction: Engineering properties, classification, types and uses of Stones, Bricks, Lime, Cement, Sand, Mortar, Steel, Concrete, Tiles, Timber, Aluminium, Paints and Varnishes, Miscellaneous, Glass, Rubber, PVC, Plaster of Paris.

UNIT-II

Principles of Architecture: Understanding fundamental principles such as contrast, proportion, scale, balance, symmetry/asymmetry, rhythm, axis, hierarchy, datum, character, colour, unity, harmony, dominance, and climax.

Planning of Buildings: National Building Code of India (2016), Building bye-laws and zoning regulations- building line, height of building, dimensions & space requirement in relation to body measurements space design for passage between walls, service access, stair, ramps, and elevators, F.S.I., setbacks, ventilation and zoning regulations. Orientation and selection of site for Buildings-Preparation of a scaled sketch of the plan of a simple single storeyed building in a given site plan

UNIT-III

Introduction to Surveying: Principles and objectives of surveying- Introduction to recent advances in Surveying, Electronic Total Stations, DTM (Digital Terrain Models); Remote Sensing, GIS (Geographic Information System), GPS (Global Positioning System), LIDAR (Light Detection and Ranging).

Introduction to Transportation Engineering: Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; Intelligent Transport Systems.

Introduction to Geotechnical Engineering: Basics of soil mechanics, rock mechanics and geology; various types of foundations; rock Mechanics and its relationship with soil mechanics and engineering geology.

UNIT-IV

Introduction to Environmental Engineering: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction.

Introduction to Water Resources Engineering: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Multi-purpose reservoir projects, hydro power projects.

Introduction to Structural Engineering: Types of Structures: Masonry type, load bearing, framed structure, RCC & Steel Structures, Types of buildings; tall structures; various types of bridges; Water retaining structures, Non-Destructive testing systems, Rehabilitation and retrofitting.

UNIT-V

Computational Methods in Civil Engineering: Overview, features, applications and system Requirements of typical software used in Civil Engineering: AUTOCAD, STAAD, ETABS, SAP2000, MXRoads, VISSIM, PLAXIS, ARCGIS, NASTRAN, NISA, ANSYS, PRIMAVERA, MATLAB, Building Information Modelling (BIM)

Suggested readings:

1. Edward Allen and Joseph Iano, *Fundamentals of Building Construction: Materials and Methods*, 5th Edition, December 10, 2008
2. Birdie G.S. and Birdie JS., *Water supply and Sanitary Engineering,* Dhanpatrai Publishers, Delhi, 6th Edition, 2002.
3. James Williamson, *Surveying & Field Work; A Practical Text-Book on Surveying, Levelling & Setting-Out,* - Paperback – Import, 1 May 2012
4. Rangwala, S.C., *Engineering Materials*, Charotar Publishing House, Anand, 2012.
5. Natarajan K.V., *Basic Civil Engineering*, Dhanalakshmi, Chennai, 2012
6. Raju. K.V.B, Ravichandran. P.T, *Basics of Civil Engineering*, Ayyappa Publications, Chennai, 2012.
7. National Building Code of India, 2016
8. Gopi, S., *Basic Civil Engineering,* Pearson Publishers
9. Kandya, A. A., *Elements of Civil Engineering*, Charotar Publishing house
10. Mamlouk, M. S., and Zaniewski, J. P., *Materials for Civil and Construction Engineering,* Pearson Publishers

Course Code	Course Title						Core/Elective
HS203MP	**Industrial Psychology**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The course will introduce the students to

- To Know Industry Structures and functions.
- Develop an awareness of the major perspectives underlying the field of Industrial Psychology
- Understanding for the potential Industrial Psychology has for society and organizations now and in the future.

Course Outcomes

After completing this course, the student will be able to:

1. Understanding of key concepts, theoretical perspectives, and trends in industrial psychology.
2. Evaluate the problems thorough and systematic competency model.
3. Analyse the problems present in environment and design a job analysis method.
4. Create a better work environment for better performance.
5. Design a performance appraisal process and form for the human behavior.

UNIT-I

Industrial Engineering: Meaning, Definition, Objective, Need, Scope, Evolution and developments. Concept of Industrial Engineering, Historical development of Industrial Engineering, main departments of Industry.

Organization Structure: Introduction, Principles of Organization, Organizational theories, Departmentalism, Authority, power, Organizational effectiveness, structuring the Organization, Organizational change, Organization charts.

UNIT-II

Motivation, Morale and Behavioural Science: Motivation, Characteristics, Kinds of motivation, Thoughts of motivational philosophy, Human needs, Incentive as motivators, Managing Dissatisfaction and frustration, Morale, Absenteeism, Behavioural Science.

Social environment: Group dynamics in Industry Personal psychology, Selection, training, placement, promotion, counselling, job motivations, job satisfaction. Special study of problem of fatigue, boredom and accidents.

UNIT-III

Understanding Consumer Behavior: Consumer behaviour, study of consumer preference, effects of advertising, Industrial morale: The nature and scope of engineering psychology, its application to industry

UNIT-IV

Work Methods: Efficiency at work, the concept of efficiency, the work curve, its characteristics, the work methods; hours of work, nature of work, fatigue and boredom, rest pauses. The personal factors; age abilities, interest, job satisfaction, the working environment, noise, illumination, atmospheric conditions, increasing efficiency at work; improving the work methods, Time and motion study, its contribution and failure resistance to time and motion studies, need for allowances in time and motion study.

UNIT-V

Work and Equipment Design: Criteria in evaluation of job-related factor, job design, human factors, Engineering information, input processes, mediation processes, action processes, methods design, work space and its arrangement, human factors in job design. Accident and Safety: The human and economic costs of accidents, accident record and statistics, the causes of accidents situational and individual factors related to accident reduction.

Suggested readings:

1. TR Banga and SC Sharma, *Industrial Engineering and Management*, Khanna Publishers, 11th Edn., 2014.
2. Tiffin, J and McCormic E.J., *Industrial Psychology*, Prentice Hall, 6th Edn., 1975.
3. McCormic E.J., *Human Factors Engineering and Design*, McGraw Hill, 4th Edn.,1976.
4. Mair, N.R.F., *Principles of Human relations*
5. Gilmer, *Industrial Psychology*
6. Ghiselli & Brown, *Personnel and Industrial Psychology.*
7. Myer, *Industrial Psychology.*
8. Dunnete, M.D., *Handbook of Industrial and Organizational Psychology.*
9. Blum & Taylor, *Industrial Psychology*

Course Code	Course Title						Core/Elective
BS206BZ	**Biology for Engineers**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

Gain vivid knowledge in the fundamentals and uses of biology, human system and plant system.

Course Outcomes

After completing this course, the student will be able to:

1. Apply biological engineering principles, procedures needed to solve real-world problems.
2. Understand the fundamentals of living things, their classification, cell structure and biochemical constituents.
3. Apply the concept of plant, animal and microbial systems and growth in real life situations.
4. Comprehend genetics and the immune system.
5. Know the cause, symptoms, diagnosis and treatment of common diseases.
6. Apply basic knowledge of the applications of biological systems in relevant industries.

UNIT-I

Introduction to Life: Characteristics of living organisms, Basic classification, cell theory, structure of prokaryotic and eukaryotic cell, Introduction to Biomolecules: definition, general classification and important functions of carbohydrates, lipids, proteins, vitamins and enzymes.

UNIT-II

Biodiversity: Plant System: basic concepts of plant growth, nutrition, photosynthesis and nitrogen fixation. Animal System: Elementary study of digestive, respiratory, circulatory, excretory systems and their functions. Microbial System: History, types of microbes, economic importance and control of microbes.

UNIT-III

Genetics and Evolution: Theories of evolution and Evidences; cell division–mitosis and meiosis; evidence of laws of inheritance; variation and speciation; nucleic acids as a genetic material; central dogma; Mendel laws, gene and chromosomes.

UNIT-IV

Human Diseases: Definition, causes, symptoms, diagnosis, treatment and prevention of diabetes, cancer, hypertension, influenza, AIDS and Hepatitis. Immunity immunization, antigen – antibody immune response.

UNIT-V

Biology and its Industrial Applications: Transgenic plants and animals, stem cell and tissue engineering, bioreactors, bio pharming, recombinant vaccines, cloning, drug discovery, biological neural networks, bioremediation, biofertilizer, biocontrol, biofilters, biosensors, biopolymers, bioenergy, biomaterials, biochips, basic biomedical instrumentation.

Suggested readings:

1. A Text book of Biotechnology, R.C. Dubey, S. Chand Higher Academic Publications, 2013
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company, 2011.
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004

4. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
5. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008
6. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012.

Course Code	Course Title						Core/Elective
ES211CE	**Engineering Mechanics**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**1**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to impart knowledge of

- Resolution of forces, equilibrium of force systems consisting of static loads
- Obtaining centroids and moments of inertia for various regular and irregular areas.
- Various forces in the axial force members, and to analyse the trusses using various methods,
- Concept of friction for single and connected bodies.
- Basic concepts of dynamics, their behavior, analysis and motion bodies
- Work energy principles and impulse momentum theory and applications to problem solving

Course Outcomes

After completing this course, the student will be able to:

1. Apply the fundamental concepts of forces, equilibrium conditions for static loads.
2. Determine the centroid and moment of inertia for various sections.
3. Analyse forces in members of a truss using method of joints and method of sections, analyse friction for single and connected bodies.
4. Apply the basic concepts of dynamics, their behavior, analysis and motion bodies.
5. Solve problems involving work energy principles and impulse momentum theory.

UNIT – I

Introduction to Engineering Mechanics: Basic Concepts

System of Forces: Coplanar Concurrent Forces, Components in Space – Resultant of coplanar and spatial systems, Moment of Force and Couple and its Application to coplanar system

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium and applications to Coplanar System.

UNIT – II

Centroid: Centroid of simple areas (from basic principles), Centroid of Composite areas.

Area Moment of Inertia: Definition, Moment of inertia of simple areas (from basic principles), Polar Moment of Inertia, Transfer formula, Moment of Inertia of Composite areas.

Centre of Gravity & Mass moment of Inertia: Centre of gravity and Mass moment of inertia of simple bodies (from basic principles).

UNIT – III

Friction: Theory of friction, Laws of friction, Friction connected to single and connected bodies. Wedge friction.

Analysis of Perfect Frames: (Analytical Method) Types of Frames, Assumptions for forces in members of perfect frame, Method of joints and Method of sections for Cantilever Trusses, simply supported Trusses.

UNIT – IV

Kinematics: Introduction, Motion of particle, Rectilinear and Curvilinear motions, Velocity and Acceleration, Types of Rigid body, Angular motion, Fixed axis rotation.

Kinetics: Introduction, fundamental equation of kinetics for a particle, D' Alembert's principle for particle motion, connected system and Fixed Axis Rotation.

UNIT – V

Work - Energy Method: Introduction, Equations for Translation, Work-Energy Applications to Particle Motion, Connected System and Fixed Axis Rotation.

Impulse Momentum Method: Linear impulse momentum, law of conservation of momentum, coefficient of restitution, Elastic impact**.**

Suggested Readings:

1. Ferdinand L. Singer, *Engineering Mechanics*, Collins, Singapore, 1975.
2. Reddy Vijay Kumar K. and K. Suresh Kumar, Singer's Engineering Mechanics, 2010.
3. S.S Bhavakatti, *Engineering Mechanics*, New age International publishers.
4. Rajeshakharam, S. and Sankarasubrahmanyam, G., *Mechanics,* Vikas Publications, 2002.
5. Junarkar, S.B. and H.J. Shah., *Applied Mechanics*, Publishers, 2001.

Course Code	Course Title						Core/Elective
ES213ME	**Energy Sciences and Engineering**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	**2**

Course Objectives

The objectives of this course is to impart knowledge of

- Able to identify various sources of energy.
- Understand the difference between Conventional and renewable energy sources.
- Identify various storage devices of Energy.
- Able to estimate the costing of power plant.

Course Outcomes

After completing this course, the student will be able to:

1. Understand the basics of various sources of energy
2. Analyse the present status of conventional energy sources.
3. Understand the working principles of Renewable Energy systems
4. Design and develop waste heat recovery systems.
5. Relate energy economics, standards and future challenges.

UNIT-I

Introduction: Various sources of energy, relative merits and demerits, Statistics and prospects of conventional and Renewable energy sources.

UNIT-II

Conventional Energy Sources: Fossil Fuels: Power generation using steam turbine and gas turbine power plants, Nuclear Fuels: Parts of reactor core, Nuclear power plant outline, Methods to dispose radioactive waste. Hydro Energy: Spillways, Hydroelectric power plant outline.

UNIT-III

Renewable Energy Systems: Solar Energy – Types of collectors and concentrators, Solar Photo Voltaic Cell. Wind Energy – Types of Wind Turbines and their working, geothermal power plant, Biomass conversion, Wave Energy power plant, Tidal Energy power plant, Ocean thermal energy power plant.

UNIT-IV

Storage: Methods to store Mechanical Energy, Electrical Energy, Chemical Energy and Thermal Energy. Co-generation &Tri-generation: Definition, application, advantages, classification, saving Potential. Energy waste, waste heat recovery classification, advantages and applications, commercially viable waste heat recovery devices.

UNIT-V

Power Plant Economics and Environmental Considerations: Costing, Estimation of power production - Pollutants and Pollution Standards -Methods of pollution control. Energy Efficiency rating and BEE standards, Future energy needs and challenges.

Suggested Readings:

1. Wakil MM, *Power Plant Technology*, McGraw Hill
2. P.K. Nag, *Power Plant Engineering*, McGraw-Hill

3. G.D. Rai, *Non-Conventional Energy Sources,* Khanna Publishers
4. Mili Majumdar, *Energy Efficient Buildings in India,* Ministry of Non-Conventional Energy Sources.

Course Code	Course Title						Core/Elective
PC221CE	**Solid Mechanics**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

- Concepts of the stress and strain for different materials and application to longitudinally stressed bars
- Evaluating shear forces and bending moments in beams, pure bending theory and determination of the bending stresses in beams
- Determining the stresses for the shearing stresses, combined action of direct load and bending moment
- Pure torsion theory and application to different types of springs.
- Evaluating principal stresses in multi-axially loaded members, applications in estimating the best failure criteria in solid materials and evaluation of stresses & strains in thin-walled pressure vessels

Course Outcomes

After completing this course, the student will be able to:

1. Apply the fundamental concepts of stress and strain in the analysis and design of axially loaded members.
2. Analyse determinate beams to determine shear forces, bending moments and determine the bending stress distribution in beams.
3. Determine the shear stress distribution in a beams and also the stresses in beams subjected to combined axial and bending loads.
4. Evaluate the stresses and strains of circular members subjected to torsion and calculate the power required for torsional revolutions of shafts.
5. Analyse the combined stresses at a point to evaluate principal stresses, and their applications in evaluating failure criteria in various materials and pressure vessels

UNIT-I

Simple Stresses and Strains: Definitions of stresses and strains, Hooke's Law, Modulus of Elasticity, Stress - Strain curve for ductile materials, Elastic constants, compound bars and temperature stresses.

Strain Energy: Strain energy and resilience in statically determinate bars subjected to gradually applied, suddenly applied, impact and shock loads.

UNIT-II

Compound Stresses: Stresses on oblique planes, principal stresses and planes. Mohr's circle of stress. Theories of Failure based on maximum principal stress, maximum principal strain, maximum shear stress, maximum strain energy and maximum shear strain energy

Application to pressure vessels: Thin cylinders subjected to internal fluid pressure, volumetric change. Thick Cylinders: Lame's equations, stresses under internal and external fluid pressures, Compound cylinders, Shrink fit pressure.

UNIT-III

Shear Force and Bending Moment: Different types of beams and loads, shear force and bending moment diagrams for cantilever, and simply supported beams with and without over hangs subjected to different kinds of loads viz., point loads, uniformly distributed loads, uniformly varying loads and couples.

Bending Stresses in Beams: Assumptions in theory of simple bending, Derivation of flexure equation, Moment of resistance, calculation of stresses in statically determinate beams for different loads and different types of structural sections.

UNIT-IV

Shear Stress in Beams: Derivation of equation of shear stresses, distribution across rectangular, circular, T and I section.

Direct and Bending Stresses: Direct loading, Eccentric loading, limit of eccentricity, Core of sections, rectangular and circular, solid and hollow sections

UNIT-V

Torsion: Theory of pure torsion in solid and hollow circular shafts, shear stress, angle of twist, strength and stiffness of shafts, Transmission of Power. Combined torsion and bending with and without end thrust. Determination of principal stresses and maximum shear stress. Equivalent bending moment and equivalent twisting moment.

Springs: Close and open coiled helical springs under axial load and axial twist, Carriage springs.

Suggested Readings:

1. D.S. Prakash Rao, *Strength of Materials- A Practical Approach*, Universities Press, 1999.
2. R.K. Rajput, *A Textbook of Strength of Materials*, S. Chand Publications, 2007.
3. R. Subramanian, *Strength of Materials*, Oxford University Press, New Delhi 2005.
4. S. S. Bhavikatti, *Strength of materials*, Vikas Publishing House, 2002.
5. Ferdinand P Beer, Johnston and De Wolf., *Mechanics of Materials*, Tata McGraw-Hill, 2004.

Course Code	Course Title						Core/Elective
PC222CE	**Engineering Geology**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	**2**

Course Objectives

The objectives of this course is to impart knowledge of

- Mineralogy, rock formation & types and geological structures
- Rock weathering, formation & classification of soils
- Geomorphology and rock mechanics
- Utility of rocks as a construction material with qualifying properties
- Geological problems associated with dams, reservoirs, tunnels and other geological hazards

Course Outcomes

After completing this course, the student will be able to:

1. Identify various minerals, rocks and analyse geological structures.
2. Explain rock weathering, classify various soils and understand hydrogeology.
3. Classify landforms based on their geomorphology and evaluate the engineering properties of rocks**.**
4. Examine rocks for their suitability in various construction applications.
5. Investigate and identify the geological problems in dams, reservoirs and tunnels, and explain the geological causes of earthquakes, tsunamis and landslides.

UNIT-I

Introduction: Engineering geology useful to civil engineering

Mineralogy: Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to weathering, Rock forming minerals.

Rocks: Igneous, sedimentary and metamorphic rocks Geological description and Indian occurrence of Granite, Basalt, Dolerite, Gabbro, Laterite, Sandstone Shale, Limestone Slate, Gneiss, Quartzite, Marble, Khondalite and chamockite.

Geological Structures: Folds, joints and faults: Fundamental types, mechanism origin and classification; Field identification and Engineering analysis of geological structures

UNIT-II

Rock Weathering: Processes and end-products of weathering; susceptibility of rocks to weathering, Assessment of the degree of weathering and its classification.

Geology of Soils: Formation, geological classification, description and Engineering use of soils Types of Indian soils.

Hydrogeology: Hydrologic cycle, water table, aquifers, occurrence of ground water in various lithological formations, geological control for ground water movement, springs, ground water exploration and ground water provinces of India.

UNIT–III

Geomorphology: Evolution, characteristics features and Engineering, considerations of fluviatile, Aeolian, glacial and marine land forms.

Rock Mechanics: Engineering properties of rocks Stress-Strain behaviour of rocks. Site Investigation: Aerial Photographs, Electrical: Resistivity and Seismic refraction methods.

UNIT- IV

Rock as a Construction Material: Geological considerations for the selection of Concrete aggregate, Highway and Runway aggregates, building stones, Decorative stones, Roofing and facing stones.

Geology of Dams and Reservoirs: Types of Dams, Problems associated with Dam foundations and reservoirs, Engineering Geological investigations for demand water tightness in reservoir site, Analysis of dam failure; Engineering Geology of major Dam sites of India

UNIT–V

Tunnels: Stand-up time of different rocks, Engineering Geological investigations of tunnels in rock, problems in tunnelling.

Geological Hazards: Geological aspects of Earthquakes, Tsunamis and Landslides;

Suggested Readings:

1. F.G. Bell, *Engineering Geology*, Elsevier, 2007.
2. Dimitri P. Krynine and William R. Judd, *Principles of Engineering Geology & Geotechnics,* CBS Publishers & Distributors, First Edition, 1998.
3. B.P. Attewel and I.W. Fanner, *Principles of Engineering Geology,* Chapman and Hall 1976.
4. Officers of the Geological Survey of India, *Engineering Geology Case Histories,* Miscellaneous Pub. No. 29, 1975.

Course Code	Course Title						Core/Elective
PC223CE	**Surveying and Geomatics**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to impart knowledge of

- To study the basic concepts & Principles of Surveying
- To know the field applications and concepts of levelling survey & Contouring
- To Know the importance of theodolite, total station and their practical applications
- Study the basic concept of trigonometrical levelling, and field applications
- Analyse the horizontal and vertical curves for survey work related to Roads & Railways
- Know the principles of aerial photogrammetry and its applications
- Study the various applications of GPS and remote sensing for field work.

Course Outcomes

After completing this course, the student will be able to:

1. Understand the basic principles of surveying.
2. Computation of lengths, areas, bearings of given field work.
3. Understand the basic working principles of theodolite and total station
4. Computation of setting out data for horizontal and vertical curves by various methods.
5. Understand and learn the basic concepts related to Photogrammetry, RS and GPS.

UNIT-I

Introduction to Surveying: Classification and principles of surveying, Survey stations, Survey lines, Direct and indirect ranging, Bearing systems and conversions, correction of bearings for magnetic declination and local attraction. Plane Table surveying: Orientation and its importance, methods of plane table surveying. Levelling: Principles of levelling, booking and reducing levels; differential, reciprocal levelling, profile levelling and cross sectioning; Auto level, Errors in Levelling; Contouring: Characteristics, methods and uses of contours; Computation of Areas and Volumes- Simpson's and Trapezoidal rule.

UNIT-II

Theodolite Survey: Introduction to Theodolite, Definitions; Fundamental lines of a Theodolite; Temporary Adjustments; Measurement of horizontal and vertical angle; Coordinates & their computations, Omitted measurements, Gales Traverse Table; Trigonometric levelling: Calculations of elevations and distances of accessible and inaccessible objects by single and double plane methods.

UNIT-III

Curves: Theory of simple curves, setting out of simple curves by linear and angular methods; Elements of simple compound curve & Reverse curve; Elements of Transition curve: length of transition curve; Vertical Curves-Length of vertical curve- Elements of Summit and sag curves.

UNIT-IV

Modern Field Survey Systems: Principle & Types of EDM instruments, Total Station: Parts of a Total Station, Advantages and Applications; Field Procedure for total station survey; Global Positioning Systems- Segments, GPS measurements, errors and biases.

UNIT-V

Photogrammetric Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph, relief displacements, terrestrial photogrammetry, flight planning.

Remote Sensing: Introduction: Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.

Suggested Readings:

1. B.C. Punmia, *Surveying Vol.1, 2 & 3,* Lakshmi Publishers, NewDelhi,1994.
2. Arora K.R., *Surveying Vol. 1 & 2,* Standard Book House, New Delhi, 2005.
3. T.M. Lillesand and R.W. Kiefer, *Remote Sensing and Image Interpretation,* John Wiley & Sons, 1994.
4. M. Chandra, *Advanced Surveying,* New Age International Publishers, New Delhi, 2000.
5. Anji Reddy, M., *Remote Sensing and Geographical Information System,* B.S. Publications, 2001.

Course Code	Course Title						Core/Elective
PC251CE	**Engineering Geology Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives

This course gives a practical hands-on experience to students to study and evaluate the physical and engineering properties of minerals and rocks, and provides exposure to various geological tests

Course Outcomes

After completing this course, the student will be able to:

1. Identify the physical and engineering properties of minerals and rocks (Exp 1-3)
2. Analyse and measure structural aspects of rocks using models (Exp 4,5,10)
3. Carry out field experiment and studies such as VES (Exp 6)
4. Perform studies such as Stereoscopic study of photographs, seismic refraction survey and Slake durability test (Exp 7, 8, 12)
5. Study the topographical and GSI maps (Exp 9, 11)

List of Experiments:

1. Identification and description of physical properties of minerals
2. Identification and description of geological and geotechnical characteristics of rocks
3. Determination of apparent specific gravity, porosity and water absorption of different rocks
4. Study of structural geology models (wooden models)
5. Measurement of dip of planar feature by clinometers compass
6. Vertical electrical sounding VES field experiment
7. Stereoscopic study of aerial photographs pertaining to landforms, vegetation and water bodies
8. Seismic refraction survey to determine depth to bedrock
9. Study of topographical maps
10. Structural geology problems (strike, dip, three point problems)
11. Study of geological survey of India (GSI works) maps and reports
12. Slake durability test on soft rock

Note: At least 10 experiments should be conducted in the semester

Course Code	Course Title						Core/Elective
PC252CE	**Surveying Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives

- To study and understand the different methods involved in survey field work
- To know the importance of theodolite, total station and their practical applications
- To study the basic concept of trigonometrical levelling, and field applications
- To analyse the curves for survey work related to Roads and Railways
- To study the applications of GPS for field work.

Course Outcomes

After completing the course, the students will able to

1. Compute lengths, areas and bearings of the given field work
2. Understand the basic working principles of theodolite and total station
3. Compute setting out data for setting out of horizontal curves by various methods
4. Understand and learn the basic concepts related to GPS

List of Experiments:

1. Applications of chain traversing to locate a building and field objects by taking perpendicular and oblique offsets and recording in the field book.
2. Study of prismatic compass and setting out a polygon
3. Plane table survey: Radiation & Intersection methods
4. Introduction to levelling: Differential levelling using dumpy/Auto level
5. Profile and cross-sectional levelling using Dumpy/Auto level
6. Measurement of horizontal angles by repetition and reiteration methods using Vernier Theodolite.
7. Measurement of vertical angle: Application to simple problems of height and distance by measuring angle of elevation and depression
8. Single plane method: Determination of R.L. of an elevated Object using two Instrument Stations which are placed in a same vertical plane- when base of the Object inaccessible.
9. Two plane method: Determination of R.L. of an elevated Object using two Instrument Stations which are not placed in the same vertical plane- when base of the Object inaccessible.
10. Setting out of a simple circular curve by linear method
11. Setting out of a simple circular curve by angular method
12. Introduction to Total station and applications: To determine difference in elevation of any two given points. The introduction includes, setting up of the Total station over a station, input values, field measurements, downloading of the data in to a computer.
13. Total station and applications: Application to simple problems of height and distance by measuring angle of elevation and depression and determination of R.L of the target object.
14. Total station and applications: Determination of area enclosed in a closed traverse having minimum 5 stations. Plot the measured values by using a software package.
15. Global Positioning System (GPS): Determination of Latitude and Longitude of any four stations and computation of the area.

Note: At least 12 experiments must be performed during the semester