Kavayitri Bahinabai Chaudhari

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Second Year Engineering

(Civil Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
3rd Cycle

COURSE OUTLINE

Semester - III

W.E.F. 2019 – 20

Syllabus Structure for Second Year Engineering (Semester – III) (Civil) wef 2019 – 20

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical /Oral		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Biology	B	3	1	-	4	40	60	-	-	100	4
Mechanics	C	3	-	-	3	40	60	-	-	100	3
Energy Science and Engineering	C	3	-	-	3	40	60	-	-	100	3
Surveying & Geomatics	D	3	-	-	3	40	60	-	-	100	3
Introduction to Civil Engineering	A	3	-	-	3	40	60	-	-	100	3
Mechanics Lab	C	-	-	2	2	-	-	25	25 OR	50	1
Surveying and Geomatics Lab	D	-	-	2	2	-	-	25	25 PR	50	1
Material, Testing & Evaluation I Lab	D	1	-	2	3	-	-	25	25 OR	50	2
		16	**1**	**6**	**23**	**200**	**300**	75	**75**	**650**	**20**

Syllabus Structure for Second Year Engineering (Semester – IV) (Civil) wef 2019 – 20

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical/Oral		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Mathematic III	B	3	1	-	4	40	60	-	-	100	4
Computer Aided Civil Engineering Drawing	C	3	-	-	3	40	60	-	-	100	3
Introduction to Fluid Mechanics	D	3	-	-	3	40	60	-	-	100	3
Introduction to Solid Mechanics	D	3	-	-	3	40	60	-	-	100	3
Civil Engineering – Societal & Global Impact	A	3	-	-	3	40	60	-	-	100	3
Computer Aided Civil Engineering Lab	C	-	-	2	2	-	-	-	-	-	1
Introduction to Fluid Mechanics Lab	D	-	-	2	2	-	-	25	25 OR	50	1
Material, Testing & Evaluation II	D	-	-	2	2	-	-	25	25 OR	50	1
Engineering Geology	D	1	-	2	3	-	-	25	25 PR	50	2
Environmental Studies	H	-	-	-	-	-	-	-	-	-	-
Internship I*	H	-	-	-	-	-	-	-	-	-	-
		16	**1**	**8**	**25**	**200**	**300**	**75**	**75**	**650**	**21**

*It is a mandatory non-credit course. It will be during Summer Vacations after Semester IV. The satisfactory completion report of internship I should be submitted to the University at the end of the semester VIII.

ISE: Internal Sessional Examination
ESE: End Semester Examination
ICA: Internal Continuous Assessment

Biology

COURSE OUTLINE

Course Title:	*Biology*	**Short Title:**	*Biology*	**Course Code:**	

Course description:

This course is introduced for learning the basic fundamentals of Life sciences (zoology & Botany) to undergraduate students. The prospectus includes a prior knowledge of Biotechnology. The goals of the course are to understand the basic principles of Biology and its applications in the field of Engineering.

Lecture	**Hours/week**	**Tutorial**	**No. of weeks**	**Total hours**	**Semester credits**
	03	01	14	42	04

Prerequisite course(s):

-

Course objectives:

1. Students will understand the structures and characteristics or functions of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
2. Students will learn the basic principles of inheritance at the molecular, cellular and Organism levels.
3. Students will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.

Course outcomes:

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

1. Use current techniques and analysis methods in molecular biology and genetics.
2. Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
3. Know the structure/function of the basic components of prokaryotic and eukaryotic cells including macromolecules and organelles.
4. Demonstrate proficiency with at least one instrument commonly used in biological research (microscope, etc).

COURSE CONTENT

Name of the Subject: Biology		**Semester:**	*III[rd]*
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Diversity of Organism and Cell Biology

Introduction: Living systems, Bio-mimicry, Metabolism, Taxonomy, Concept of species, Structural organization of life, Concepts of modern cell, history of cell, Cell theory, Structure of cell:- Cell shape, size and cell number, Types of cells:- Prokaryotic cells and Eukaryotic cells, Chemistry of cells.

Cell Division: Cell cycle, mitosis, meiosis, mitotic cell division, cell cycle check points, meiotic cell division, embryonic cell division, cell death.

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

Plant and Animal Kingdom

Plant Kingdom:

Introduction to plants, Salient features of major plant groups: Bryophyta, Pteridophyta, Gymnospermae, Angiospermae,

Plant Growth & Development: Introduction, Seed Dormancy, Seed Germination, Phases of growth, Plant growth hormones.

Animal Kingdom:

Animal Classification, Salient features of non-chordates upto phylum level: Phylum porifera, phylum Cnidaria, Phylum Ctenophora, Phylum Platyhelminthes.

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Plant Cell and Animal cell culture and Applications

Plant Cell Culture:

Brief introduction to cell culture with respect to the properties of plant cells, Media requirements, Typical media used, Classification of tissue culture, callus culture, cell suspension culture, Application of callus culture and cell suspension culture, Plant cell cultivation Bioreactors

Animal Cell Culture:

Brief introduction to animal cell culture, Culture medium: Natural and Artificial media, introduction to balanced salt solutions and simple growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, Animal Bioreactors.

Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Microbial Culture and Applications:

Introduction, Microbial Culture Techniques, growth curve, Pure culture techniques – microbial culture media, isolation, identification and maintenance of cultures, incidences of microorganisms in soil, water, air, food and sewage, food spoilage organisms, Applications of Microbial Culture Technology.

Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**

Biotechnology and its Applications:

Definitions, scope of Biotechnology, Recombinant DNA Technology: Making Recombinant DNA, Tools in Genetic Engineering, Polymerase Chain reaction (PCR).

Applications of Biotechnology:

Bioinformatics, Biomechanics, Biotechnology of waste treatment, Biosensors, Forensic science, Food Biotechnology, Fermentation Technology.

Text Books:

1. B.D. Singh " Genetics" Kalyani Publications Third Edition.
2. C.B. Pawar"Cell Biology" Himalaya Publications, Third Edition.
3. C.B. Pawar"Cell and Molecular Biology" Himalaya Publications.
4. Text book of Zoology by V.K. Agrawal, S. Chand Publication.
5. Text book of Botany by Dr. B.P. Pandey S. Chand Publication.

6. Text book of Biotechnology by R.C. Dubey, S. Chand Publications.

Reference Books:

1. P. K Gupta, Introduction to Biotechnology, Rastogi Publications.
2. B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
3. S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.

Mechanics					
COURSE OUTLINE					
Course Title	Engineering Mechanics	**Short Title**	EM	**Corse Code**	ESC205
Course Description:					
This Course is to provide an introductory treatment of *Engineering Mechanics* to all the students of engineering, with a view to prepare a good foundation for taking up advanced courses in the area in the subsequent semesters. A working knowledge of statics with emphasis on force equilibrium and free body diagrams. Provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems, and an understanding of the mechanical behavior of materials under various load conditions and understanding of the basic concepts of dynamics.					
Lecture	**Hours/week**	**No. of weeks**	**Total Hours**	**Semester Credit**	
	3	14	42	3	
Prerequisite course(s):					
-					
Course objective:					
a) Confidently tackle equilibrium equations, moments and inertia problems. b) Master calculator/computing basic skills to use to advantage in solving mechanics problems. **c)** Gain a firm foundation in Engineering Mechanics for furthering the career in Engineering.					
Course Outcomes:					
After successful completion of this course this student will be able to 1. To understand use of scalar and vector analytical techniques for analysis forces in statically determinate structures. 2. To apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple practical problem and to apply basic knowledge of math and physics to solve real-world problem. 4. To understand measurement error and propagation of error in processed data. 5. To understand Newton's law of motion and basic concept of – force, momentum, work and energy principle, Impulse – Momentum principle and coefficient of restitution.					

COURSE CONTENT			
Engineering Mechanics		**Semester**	III
Teaching Scheme		**Examination Scheme**	
Lectures:	3 hours/week	**End Semester Exam (ESE):**	60 Marks
		Duration of (ESE):	03 Hours
		Internal Sessional Exam (ISE):	40 Marks
Unit I		**No. of Lectures:** 09 Hours	**Marks:**12
Introduction to Engineering Mechanics: Fundamental principles, basic concepts, concept of force, scalar and vector quantities. Resultant of force system: Composition and resolution of force, resultant of coplanar concurrent force system. Concept of moment and couple: Varignon's theorem, resultant of non-concurrent coplanar force system. Equilibrium of coplanar force system, concept of equilibrium, condition of equilibrium, free body diagram, types of supports and support reactions, equilibrium of forces in plane. Friction: Introduction to friction, laws of friction, friction on horizontal and inclined planes, Ladder Friction, wedge friction.			
Unit II		**No. of Lectures:** 09 Hours	**Marks:**12
Analysis of statically determinate structure: Beams with different support conditions, Cables and frames, Simple trusses: method of joints and method of sections.			
Unit III		**No. of Lectures:** 08 Hours	**Marks:**12
Centroid and Centre of Gravity: Introduction, Centroid of simple figures from first principle, centroid of composite figures. Centre of Gravity and its implication Moment of inertia – Introduction, perpendicular axis theorem, parallel axis theorem, radius of gyration, moment of inertia of standard geometrical shape.			

Mass moment of inertia of standard shapes.		
Unit IV	**No. of Lectures:** 08 Hours	**Marks:**12
Kinematics of particles: Rectilinear motion, equation of motion, types of rectilinear motion, motion curves. Curvilinear motion: rectangular coordinate, normal and tangential components, and path coordinates. Projectile motion.		
Unit V	**No. of Lectures:** 08 Hours	**Marks:**12
Newton's second law, D' Alembert's Principle Work energy principle Impulse and moment principle Types of impact Kinetics of circular and rotational motion.		
Text Books:		
1. Bhavikatti S. S. & K. G. Rajashekarappa, "Engineering Mechanics", New Age International (P) Ltd., Publishers. 2. S R Bendale, "Engineering Mechanics", John Wiley & Sons, Delhi, 1st Edition. 3. Jaget Babu, "Engineering Mechanics", Pearson Education, Delhi, 1st Edition. 4. Bansal R.K., A Text Book of Engineering Mechanics, Laxmi Publications. 5. Khurmi R.S., Engineering Mechanics, S. Chand & Co. 6. Tayal A.K., Engineering Mechanics, Umesh Publications.		
Reference Book:		
1. F P Beer and E R Johnson, "Mechanics for Engineers – Statics", McGraw-Hill Publication. 2. F P Beer and E R Johnson, "Mechanics for Engineers – Dynamics", McGraw-Hill Publication. 3. S P Timoshenko and D H Young, "Engineering Mechanics", McGraw- Hill Publications. 4. R C Hibbeler, "Engineering Mechanics statics and dynamics", Pearson Education.		

Energy Science and Engineering					
COURSE OUTLINE					
Course Title:	Energy Science and Engineering	**Short Title:**	*ESE*	**Course Code:**	*ESC 212*

Course description:

This course provides an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application. It includes exploration of society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, geothermal, ocean thermal, hydro and nuclear. It emphasizes Energy conservation methods from Civil Engineering perspective. The knowledge acquired will lay a good foundation for design of various civil engineering systems/ projects dealing with these energy generation paradigms in an efficient manner.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	*14*	*42*	*3*

Prerequisite course(s):

-

Course objectives:

The objective of this Course is to provide an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application. The class will explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, geothermal, ocean thermal, hydro and nuclear. Energy conservation methods will be emphasized from Civil Engineering perspective. The knowledge acquired lays a good foundation for design of various

civil engineering systems/ projects dealing with these energy generation paradigms in an efficient manner.

Course outcomes:

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

1. To understand the importance of energy resources.
2. To understand global energy crises and its socio- economic impact.
3. To evaluate the role of engineers in energy management.
4. To analyze and apply the concept of energy efficiency in civil engineering projects.
5. To assess the importance of alternative energy sources in civil engineering perspective and energy efficient buildings.

COURSE CONTENT

Name of the Subject: Energy Science and Engineering		**Semester:**	*III*
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Introduction to Energy Science: Scientific principles and historical interpretation to *place ener*gy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

Energy Sources: Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems;

possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Civil Engineering Projects connected with the Energy Sources: Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Engineering for Energy conservation: Concept of Green Building and Green Architecture;Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); *LEED ratings;* Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Energy & Environment: Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy.		
Text Books:		
1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press		

2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press
3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam

Reference Books:

1. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
2. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
3. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company

Surveying and Geomatics					
COURSE OUTLINE					
Course Title:	**Surveying and Geomatics**	**Short Title:**	*SUR &G*	**Course Code:**	**PCC CE206**

Course description:

This course is set keeping in mind the requirements of undergraduate students of engineering .This course provides the fundamental knowledge of surveying and leveling which includes

i) Basic principles of surveying and important aspect of leveling.

ii) Engineering surveys such as profile leveling and cross sectioning

iii) Measurement of horizontal and vertical angle ,magnetic bearings, deflection angle by using theodolite

iv) Traverse computation- consecutive and independent coordinates.

v) Tachometric surveying- measurement of horizontal and vertical distances,tacheometric contouring

vi) Plane table survey

vii) Photogrammetry and remote sensing

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	*14*	*42*	*3*

Prerequisite course(s):

-

Course objectives:

With the successful completion of the course, the student should have the capability to:

- To describe the function of surveying in civil engineering construction,

- Work with survey observations, and perform calculations,
- Customary units of measure. Identify the sources of measurement errors and mistakes; understand the difference between accuracy and precision as it relates to distance, differential leveling, and angular measurements
- Be familiar with the principals of recording accurate, orderly, complete, and logical field notes from surveying operations, whether recorded manually or with automatic data collection methods,
- Identify and calculate the errors in measurements and to develop corrected values for differential level circuits, horizontal distances and angles for open or closed-loop traverses,
- Operate an automatic level to perform differential and profile leveling; properly record notes; mathematically reduce and check levelling measurements,
- Effectively communicate with team members during field activities; identify appropriate safety procedures for personal protection; properly handle and use measurement instruments. Be able to identify hazardous environments and take measures to insure one's personal and team safety,
- Measure horizontal, vertical, and zenith angles with a transit, theodolite, total station or survey grade GNSS instruments,
- Calculate azimuths, latitudes and departures, error of closure; adjust latitudes and departures and determine coordinates for a closed traverse,

Course outcomes:

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

(i) Understand the importance and scope of surveying in any engineering project.

(ii) To know the principles of surveying.

(iii) To know the types of surveying.

(iv) To be able to use the traditional and advanced instruments of surveing.

(v) To execute a survey project.

Surveying and Geomatics

COURSE CONTENT

		Semester:	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
Practical : 2 hours/week		**Duration of ESE:**	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Introduction to surveying

- Surveying- Definition, principle of surveying, various types of surveying Steps in survey, chain and offset. Ranging, compass, bearing, local attraction, bearings, chain and compass traversing, errors, elimination of error.

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

Part [B] Leveling

- Instruments used in leveling, dumpy level, automatic level, types of leveling staves.
- Principal axes of dumpy level, reciprocal leveling curvature and refraction correction, distance to the visible horizon.
- Bench mark and its types, reduced level, rise and fall method, height of instrument method.
- Profile leveling: L - section and cross -sections.
- Numerical on leveling

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Theodoloite

- Principal axes and temporary adjustments of transit theodolite.
- Uses of theodolite: measurement of horizontal angles, vertical Angles, magnetic bearings, measuring deflection angles.
- Theodolite Traversing: Computation of consecutive and independent co-ordinates, adjustments of closed traverse, Gales traverse by co-ordinate method, Numerical on Theodolit

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

Tachometry

- Principle of stadia method, fixed hair method with vertical staff to determine horizontal distances and elevations of the points.
- Use of tachometry in surveying, contour, characteristics and uses, methods of interpolation, tachometric contour survey.
- Numerical on **Tachometry**

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Plane Table Survey

- Objective and equipment required for plane table survey.
- Methods of plane tabling - radiation, intersection, traversing and resection.
- Advantages, disadvantages, limitations and errors of plane Table surveying, .three point problem
- Minor instruments: Study and use of abney level, box sextant, digital planimeter.

Introduction to triangulation, photo-grametry and remote sensing.

Text Books:

1. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
2. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
3. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
4. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
5. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.
6. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015

Reference Books:

1. Surveying and Leveling (Vol – I & II) by T. P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune,
2. Surveying Vol. I and Vol. II by B. C. Punmia, Laxmi Publication (P) New Delhi.
3. Principles of surveying by Cliver and Clendening
4. Advance surveying, Vol. I & II, Handbook by P.B. Shahani
5. A handbook of accurate surveying methods by S. P. Collins

<table>
<tr><td colspan="6">Introduction To Civil Engineering</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td colspan="2">Introduction To Civil Engineering</td><td>Short Title:</td><td>ICE</td><td>Course Code:</td><td>HSMC251</td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">This course introduces the student with various aspects of civil engineering, importance, scope and role of civil engineering in societal development, responsibilities of civil engineer and impact of civil engineering in the development of society and environment.</td></tr>
<tr><td rowspan="2">Lecture</td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td colspan="2">Semester credits</td></tr>
<tr><td>3</td><td>14</td><td>42</td><td colspan="2">3</td></tr>
<tr><td colspan="6">Prerequisite course(s):</td></tr>
<tr><td colspan="6">-</td></tr>
<tr><td colspan="6">Course objectives:</td></tr>
<tr><td colspan="6">• To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering
• To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness.
• To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">Course outcomes:</td></tr>
</table>

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

The course outcomes can be summarized as follows:

- To understand what constitutes Civil Engineering and to identify the various areas available to pursue and specialize within the overall field of Civil Engineering
- To Understanding the vast interfaces this field has with the society at large
- To do creative and innovative work in civil engineering
- Highlighting possibilities for taking up entrepreneurial activities in this field
- Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering

COURSE CONTENT

Introduction to Civil Engineering		**Semester:**	*IV*
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Basic Understanding: What is Civil Engineering/Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career.

History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers

Overview of National Planning for Construction and Infrastructure Development; five year plan outlays.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Fundamentals of Architecture & Town Planning: Hierarchy in construction industry, role of different agencies involved in construction, fundamentals of town planning. Role of architect, Green Buildings and LEED ratings; Development of Smart cities

Type of structures, classification based upon function, load transfer mechanism, material of construction etc. Components of building structures.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Fundamentals of Building Materials: General properties of Stones, bricks, mortars, cement, Plain, Reinforced & Prestressed Concrete, Structural Steel, High Tensile Steel, Carbon Composites. Their occurrence in nature/manufacturing. Plastics in Construction; Recycling of Construction & Demolition wastes Basics of Construction Management & Contracts Management, Temporary Structures in Construction; Major Construction equipment; Automation & Robotics in Construction; Importance of Contracts.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Environmental Engineering & Sustainability: Water treatment systems; Effluent treatment systems; Solid waste management; sanitation. Sustainability in Construction; **Geotechnical Engineering**: Soil mechanics, scope,importance, soil: a 3phase system, B.C. definition, basic methods of determinstion of BC. Broad classification of foundations. **Fluid mechanics and Water Resources Engineering**: Fundamentals of fluid mechanics. Applications of FM, Multi-purpose reservoir projects, conventional water harvesting systems. Socio economic aspects.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Ocean Engineering: Ports & Harbours and other marine structures. **Power Plant Structures**: Chimneys, Natural & Induced Draught Colling towers, coal handling systems, ash handling systems; nuclear containment structures types of bridges and tunnels. **Repairs & Rehabilitation of Structures:** Basics of corrosion phenomena and other structural distress mechanisms; some simple systems of rehabilitation of structures; Non-Destructive testing systems; Use of carbon fibre wrapping and carbon composites in repairs.		

common software used in civil engineering.
Text Books:
1. Basic Civil Engineering, by Sathish Gopi, Pearson Publication. 2. A Basic Concept in Civil Engineering, Sunder Narayan, Atlantic Publishers and Distributors Pvt Ltd. 3. Basic Civil Engineering, B C Punmia and Ashok Kumar Jain, Laxmi Publications.
Reference Books:
1. An Elementary Course Of Civil Engineering by and Dennis Hart Mahan, Howards Press Publication. 2. Elementary Course of Civil Engineering by Joseph Mathieu Sganzin, Nabu Press.

Mechanics Lab					
LAB COURSE OUTLINE					
Course Title:	Mechanics Lab	**Short Title:**	EM LAB	**Course Code:**	
Course description:					
These laboratories cover experiments related to basic principles of Statics, Dynamics.					
Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	
	2	14	28	1	
End Semester Exam (ESE) Pattern:		***Practical (PR) / Oral (OR)***			
Prerequisite course(s):					
Nil					
Course objectives:					

General Objective:

In these laboratories students will be introduced to the applications of different theorems of mechanics to solve problems in statics and dynamics.

These include:

a) Concept of vectors.

b) Triangle law of forces.

c) Lami's theorem.

d) Conditions of equilibrium.

e) Laws of friction.

f) Laws of simple machines.

Objective to develop following Intellectual skills:

a) To understand basic laws of engineering mechanics & apply the same to solve problems.

b) To learn use of prismatic compass for angular measurements.

c) To identify principles and working of different apparatus in laboratories.

Objective to develop following Motor skills:

a) Ability to draw diagrams and graphs.

b) Ability to apply forces and measure the corresponding effects.

c) Ability to perform the experiments and record the observations.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

a) To experimentally verify basic principles of mechanics.
b) To solve problems of mechanics by graphical methods
c) To get an exposure to simple machine used in civil engineering.
d) To determine simple mechanical properties of materials like coefficient of friction.
e) To be able to assess the efficiency, and velocity ratio of simple machines.

LAB COURSE CONTENT

Mechanics Lab		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	***25 marks***
		Internal Continuous Assessment (ICA):	***25 marks***

1. Study of vectors.

a. To calculate resultant of coplanar and non coplanar (space) forces.

b. To calculate unknown force (reaction)

2. Verification of law of polygon of forces.

a. To verify law of polygon of forces.

b. To calculate analytically and experimentally resultant of concurrent force system.

c. To compare analytical values with measured ones.

3. Verification of Lami's theorem.

a. To Verify Lami's theorem.

b. To observe the ratios of P/sin α, Q/sin β, R/sin γ and compare the same.

4. Forces in jib crane

a. To study law of triangle of forces analytically and graphically.

b. To apply conditions of equilibrium.

c. To calculate forces in members of jib crane.

d. To compare the theoretical results with experimental values.

5. Reactions of beam.

a. To verify conditions of equilibrium of a system of coplanar parallel forces using reaction of beam apparatus.

b. To understand active and reactive forces.

6. Simple friction on horizontal and inclined planes.

a. To describe frictional force, limiting friction, coefficient of friction, angle of repose.

b. To know the concept that the Force ∝ Reaction.

c. To find coefficient of friction for bodies in equilibrium on inclined planes.

7. Study of simple machines and verification of law of machines

a. To describe efficiency, load, effort, velocity ratio, frictional effort and verify law of machines.

b. To establish the law of machine from graph.

8. Graphical work (Statics) – (minimum three problems on graphical solution of Static's problems).

To understand graphical method to solve the problems in statics.

a. To solve the problem on coplanar concurrent forces, parallel forces and reactions of beam by

graphical method.

b. To describe Bow's notation, space diagram, vector diagram, polar diagram, funicular diagram and to draw the same.

9. Graphical work (Dynamics) – (minimum two problems on graphical solution of Dynamic's problems).

a. To draw the motion curve and understand the significance of the same.

b. To calculate displacement and distance travelled from V-T diagram.

Reference Books:

1. Engineering Mechanics Lab Manual A K Gupta and M Bhoot, Scientific Publishers.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guidelines for ESE:

ESE will be based on practical assignments submitted by the student in the form of journal. In ESE the student may asked to answer questions based on experiments/assignments. Evaluation will be based on performance in oral examination.

Surveying and Geomatics LAB

LAB COURSE OUTLINE

Course Title:	**Surveying and Geomatics Lab**	**Short Title:**	*SUR &G*	**Course Code:**	**PCC CE206**

Course description:

i) Measurement of horizontal and vertical angle ,magnetic bearings, deflection angle by using theodolite.

ii) Traverse computation- consecutive and independent coordinates.

iii) Tachometric surveying- measurement of horizontal and vertical distances,tacheometric contouring

iv) Plane table survey

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	*14*	*28*	*1*

Prerequisite course(s):

-

Course objectives:

With the successful completion of the course, the student should have the capability to:

1. Operate variety of survey instruments including total station to measure distance, angles, and to calculate differences in elevation.
2. Work as a team member on a surveying party to achieve a common goal of accurate and timely project completion,
3. Able to plan a full scale survey project.

Course outcomes:

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

4. Operate variety of basic survey instruments for horizontal and vertical control of ground.
5. Handle advanced instruments of survey like EDM, total station etc.
6. To plot topo-sheets based upon survey data.
7. To layout on site a given plan.
8. Able to command a full scale survey project

LAB COURSE CONTENT

Surveying and Geomatics LAB		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Sessional Exams (ISE):	**25 marks**

List of Practical

Group A (Practical exercise)

- Use and Study of Dumpy level for finding the levels by various methods.
- Measurements of horizontal and vertical angles by transit Theodolite
- Measurements of horizontal angles of a triangle by repetition method
- Computation of horizontal distances and elevations by Tachometry for horizontal and inclined sights.
- Radiation and intersection method in plane Table survey.
- Use of box sextant, Abney level and digital plan meter.

Group B (Projects)

Project-1:- Theodolite Traverse survey project of a closed traverse with at least four sides.

Project-2:- Tachometric contouring project with at least two instrument stations at 60 m apart.

Project-3:- Road project for minimum length of 200m, including fixing of alignment, profile

leveling, and cross sectioning.

Project-4:- Plane table survey project of a closed traverse of minimum four sides

Text Books

1. Surveying I Laboratory Manual, AURORA'S TECHNOLOGICAL AND RESEARCH INSTITUTE, available on http://www.atri.edu.in/images/pdf/departments/Survey-I%20Lab%20Manual%20Final.pdf.

Reference Books

1. The practical surveyor, or, the art of land-measuring, made easy. ... To which is added, an appendix, ... By Samuel Wyld, Gent, Gale ECCO, Print Editions (May 27, 2010).
2. Practical Surveying and Computations, Second Edition 2nd Edition by A L Allan, Butterworth-Heinemann; 2 edition (October 8, 1997).
3. Practical Marine Surveying by Harry Phelps (Author) BiblioLife (March 19, 2009).
4. A Practical Guide to Aerial Photography with an Introduction to Surveying, Ciciarelli, J.A. Springer US, 1991.

Guide lines for ICA

The Term Work will consist of:

(i) Field book containing record of all exercises and projects listed above.

(ii) File of full imperial size drawing sheets as mentioned below

1) Theodolite Traverse survey project. 1 sheet
2) Tachometric contouring project……..1 sheet

3) Road project showing L- section, plan of road and typical cross -section…….Min -1 sheet 4) Plane Table Traverse survey project…..1 sheet
Guide lines for ESE
ESE will be based on laboratory field book and sheets submitted by the student. In ESE the student may asked to answer questions based on experiments/assignments. Evaluation will be based on performance in oral/ practical examination

Materials, Testing & Evaluation I Lab					
LAB COURSE OUTLINE					
Course Title:	**Materials, Testing & Evaluation I Lab**	**Short Title:**	**MTE I**	**Course Code:**	**PCC-CE207**
Course description:					
Civil engineering is a material intensive industry. It uses a variety of materials. For a civil engineer to learn about the basic engineering properties of civil engineering materials. So that the civil engineer could use these materials efficiently. The main focus is on testing of materials used in concrete. The course reviews the current testing technology and examines force applications systems, force measurement, strain measurement, important instrument considerations, equipment for environmental testing, and computers applications for materials testing provide an introductory					

treatment of *basic skills in material engineering towards (i) selecting material for the design, and (ii) evaluating the mechanical and structural properties of material, as well as the knowledge necessary for a civil engineer.* The knowledge acquired lays a good foundation for analysis and design of various civil engineering structures/systems in a reliable manner

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Theory	1	14	14	2
Laboratory	2	14	28	

Prerequisite course(s):

-

Course objectives:

The objective of this Course is to train the student to characterize the civil engineering materials, and to confirm their suitability for variety of construction works as per relevant IS specifications.

Course outcomes:

The student must be able to:

1. To understand the relevant IS specifications for various construction materials.
2. To use the various equipments used for testing of civil engineering materials.
3. To assess the various civil engineering characteristics of material as per IS specifications.
4. To evaluate the suitability of construction material.
5. To design a concrete mix.

LAB COURSE CONTENT

Materials, Testing & Evaluation I Lab		**Semester:**	*III*
Teaching Scheme:		**Examination scheme**	
Theory	**1 hours/week**	**End semester exam (ESE):**	**25**
Practical	**2 hours/week**	**Internal Continuous Assessment (ICA)**	**25**

Introduction to Engineering Materials covering, What is the "Material Engineering"?; Cements, M-Sand, Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete) Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics, Structural Steel and other Metals, Paints and Varnishes, Acoustical material and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties and uses of these. Mechanical behavior and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; Tensile test – standards for different material (brittle, quasi-brittle, elastic and so on) True stress – strain interpretation of tensile test; hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep – fundaments and characteristics; Brittle fracture of steel – temperature transition approach; Background of fracture mechanics; Discussion of fracture toughness testing – different materials; concept of fatigue of materials; Structural integrity assessment procedure and fracture mechanics

Standard Testing & Evaluation Procedures covering, Laboratory for mechanical testing; Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals; Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures; Fracture mechanics – background; Fracture toughness – different materials; Fatigue of material; Creep

List of Practical

1. Testing of cement: fineness, consistency, soundness, Initial Setting Time, Final Setting Time.
2. Compressive strength of cement.
3. Fineness modulus of sand.
4. Moisture content of sand.
5. Aggregate impact value
6. Crushing value of aggregate
7. Specific gravity of aggregate.
8. Flakiness and elongation index of aggregate.
9. Los Angeles Method of aggregate abrasion value.
10. Testing of bricks: size, moisture content, crushing strength, efflorescence.

11. Testing of tile/paver block.
12. Compressive strength of concrete (28 days).
13. Spilt tensile strength of concrete.
14. Plotting of Stress Strain Curve of steel

Visit to a brick making site, sand query and cement factory is recommended.

students must do an assignment on concrete mix design using IS method.

Text Books

1. Concrete Technology by M S Shetty, S Chand Publication.
2. Building Materials by S C Rangwala, Charotar Publishing House, India.

Reference Books:

1. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition
3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materialsused for Civil Engineering applications
4. Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
5. E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition
6. American Society for Testing and Materials (ASTM), *Annual Book of ASTM Standards* (post 2000)

Guidelines for ICA

The student must perform all the above mentioned practical and submit in the form of journal.

Site visit is desirable.

assignment: Students must learn concrete mix design by IS method.

Guidelines for ESE
the ESE must be in the form of oral examination. The student must be able to answer questions based upon the journal submitted by him/her, site visit report and the assignment.

Kavayitri Bahinabai Chaudhari

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Second Year Engineering

(Civil Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
3rd Cycle

COURSE OUTLINE

Semester - IV

W.E.F. 2019 – 20

Syllabus Structure for Second Year Engineering (Semester – IV) (Civil) wef 2019 – 20

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical/Oral		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Mathematic III	B	3	1	-	4	40	60	-	-	100	4
Computer Aided Civil Engineering Drawing	C	3	-	-	3	40	60	-	-	100	3
Introduction to Fluid Mechanics	D	3	-	-	3	40	60	-	-	100	3
Introduction to Solid Mechanics	D	3	-	-	3	40	60	-	-	100	3

Civil Engineering – Societal & Global Impact	A	3	-	-	3	40	60	-	-	100	3
Computer Aided Civil Engineering Lab	C	-	-	2	2	-	-	-	-	-	1
Introduction to Fluid Mechanics Lab	D	-	-	2	2	-	-	25	25 OR	50	1
Material, Testing & Evaluation II	D	-	-	2	2	-	-	25	25 OR	50	1
Engineering Geology	D	1	-	2	3	-	-	25	25 PR	50	2
Environmental Studies	H	-	-	-	-	-	-	-	-	-	-
Internship I*	H	-	-	-	-	-	-	-	-	-	-
		16	**1**	**8**	**25**	**200**	**300**	**75**	**75**	**650**	**21**

MATHEMATICS-III					
COURSE OUTLINE					
Course Title:	**Mathematics –III**	**Short Title:**	**M-III**	**Course Code:**	BSC201
Course description: Basic Science course					
This course familiarize the prospective engineers with techniques in Laplace Transform, Fourier and Z-trasform. It equips the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their discipline					

Lecture 03	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
Tutorial 01	4	14	42	4

Prerequisite course(s):

-

Course objectives:

The objective of this course is to familiarize the prospective engineers with techniques in Laplace Transform,Fourier and Z-trasform. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their discipline.

Course outcomes:

Upon completion of this course, students will be able to solve field problems in engineering involving PDEs and ODEs using Laplace Transform. They can also formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.

COURSE CONTENT

Maths -II1		**Semester:**	III
Teaching Scheme:		**Examination scheme**	
Lectures:03	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
Tutorial:01		**Duration of ESE:**	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

***Transform Calculus*-1**

Polynomials – Orthogonal Polynomials – Lagrange's, Chebysev Polynomials; Trigonometric Polynomials; Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method.

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

***Transform Calculus*-2**

Fourier transforms, Z-transform and properties, methods, inverses and their applications.

Unit–III:	**No. of Lectures:08 Hours**	**Marks: 12**

Basic Statistics:

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Applied Statistics:

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**

Small samples:

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Text Books /Reference Books:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition
4. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi.

Computer-aided Civil Engineering Drawing					
COURSE OUTLINE					
Course Title:	**Computer-aided Civil Engineering Drawing**	**Short Title:**	**CAED**	**Course Code:**	
Course description:					
This course introduces the student about concepts in building design and drawing such as building definition, types of building, principle of planning, building rules, regulations. The student also					

learns a graphic software, preferable Auto CAD to draw his ideas using computers.				
Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	03
Prerequisite course(s):				
Engineering graphics				
Course objectives:				
To introduce the student with the basics of computer graphics. To introduce the students with the basics of building planning and construction.				
Course outcomes:				
The students will be able to 1. Understand the principles of building planning. 2. Prepare drawings of an existing building based upon measurements. 3. Apply a graphic assisting software to prepare drawings. 4. Plan and draw a building plan. 5. Detail out a building plan.				
COURSE CONTENT				

		Semester:	*IV*
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Building definition and types of building as per occupancy, principles of planning of residential buildings, building bye laws & its necessity. Ventilation: -Necessity of ventilation, systems of ventilation, Air conditioning: - Classification, comfort and comfort conditions, Fire protection: - Fire load, fire safety, fire escape elements. Building services: Its importance, constructional requirements for different building services-like electrical, Tele communication service & plumbing services : Layout of water supply and drainage system, one pipe and two pipe system, septic tank		
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**
BUILDING DRAWING- Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan. (load bearing or frame Structure)		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Planning and designing of Educational buildings, hostel buildings, library buildings, Hotels buildings, hospitals commercial complex buildings, bank buildings, post office buildings, (frame Structure only)		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Planning and designing of apartment houses(flats) (framed Structure only) Perspective view of building: one point and two point perspective drawings		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, co-ordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards. *SYMBOLS AND SIGN CONVENTIONS*: Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel		

Text Books:

1. Building Drawing - M.G. Shah, C.M. Kale, S.Y. Patki - Tata Mcgraw Hills pvt. Ltd.New Delhi.
2. Y.S.Sane - Planning & Designing Building.
3. Building Science and Planning by S. V. Deodhar, Khanna Publihsers
4. National building Code

Reference Books:

- Subhash C Sharma & Gurucharan Singh, "Civil Engineering Drawing", Standard Publishers
- Ajeet Singh, "Working with Auto CAD", Tata- Mc Graw-Hill Company Limited, New Delhi
- Sham Tickoo Swapna D, "AUTOCAD for Engineers and Designers", Pearson Education,
- Venugopal, "Engineering Drawing and Graphics + AUTOCAD", New Age International Pvt. Ltd.,
- Balagopal and Prabhu, "Building Drawing and Detailing", Spades publishing KDR building, Calicut, (Corresponding set of) CAD Software Theory and User Manuals.
- Malik R.S., Meo, G.S. Civil Engineering Drawing, Computech Publication Ltd New Asian.
- Sikka, V.B., A Course in Civil Engineering Drawing, S.K.Kataria& Sons,

Introduction to Fluid Mechanics

COURSE OUTLINE					
Course Title:	**Introduction to Fluid Mechanics**	**Short Title:**	*IFM*	**Course Code:**	

Course description:

This course provides the elementary level knowledge of fluid mechanics which includes

- Study of fluid properties
- Fluid Statics
- Kinematics and Dynamics of fluid flow.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	3	14	42	3

Prerequisite course(s):

-

Course objectives:

The general objective of course is to teach fluid and flow properties and to analyze and solve fluid problems under static and dynamic conditions. Measurement of pressure, computations of hydrostatic forces on structural components and the concepts of Buoyancy all find useful applications in many engineering problems.

Course outcomes:

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

- Understand scope and importance of fluid mechanics in civil engineering.
- Understand definitions of the basic terms used in fluid mechanics.
- Evaluate and assess the basic engineering properties of fluid mechanics.
- Understand the fundamental principles of fluid statics, kinematics and dynamics and apply them for fluid analysis.
- Understand classifications of fluid flow.

Introduction to Fluid Mechanics

COURSE CONTENT

	Semester:	**IV**
Teaching Scheme:	**Examination scheme**	

Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Basic Concepts and Definitions – fluid, scope and applications of fluid mechanics;Properties of fluid- Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility

Unit–II:	**No. of Lectures: 09Hours**	**Marks: 12**

Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature,. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Introduction to Buoyancy and stability of floating bodies only.(No mathematical treatment)

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Fluid Kinematics- Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One and three -dimensional continuity equations in Cartesian coordinates

Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Fluid Dynamics- forces acting on fluid in motion; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber *Number and Euler Number; Buckingham's* π-Theorem.

Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**

Flow through opening – **Orifices**-type,coefficient of velocity,contraction and discharge,small and large orifice

***Mouthpieces* –** Types,external cylindrical mouthpiece

Flows over notches and weirs(No Mathematical Treatment) – Rectangular, triangular and trapezoidal notches and weirs,Cipolletti weir, empirical formulae for discharge over rectangular weirs, correction for velocity of approach and end contractions**(No Mathematical Treatment)**

Text Books:

- A Textbook of Fluid Mechanics and Hydraulic Machine by Dr. R K. Bansal,Laxmi Publication
- A Textbook of Fluid Mechanics by P.V.Shrotri,Nirali Publication.

Reference Books:

- Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
- Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
- Fluid Mechanics by Dr. A. K. Jain, Khanna Publishers, Delhi

INTRODUCTION TO SOLID MECHANICS

COURSE OUTLINE

Course Title:	**INTRODUCTION TO SOLIDS MECHANICS**	**Short Title:**	**ISM**	**Course Code:**	**PCC-CE-205**

Course description:

Civil engineering is responsible for providing basic infra structure for various activities. Any infra structural facility is subjected to load. The role of an engineer is to provide the geometric section of the facility to sustain the load. For this, the engineer must know the behavior of the material under given load. This is studied under this subject.

Lectures :	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	**Hours/week**
	3/Week	14	42	3	3/Week

Prerequisite course(s):

Nil

Course objectives:

The objective of this Course is to introduce to continuum mechanics and material modelling of engineering materials based on first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds; plasticity and yield design. The overarching theme is a unified mechanistic language using thermodynamics, which allows understanding, modelling and design of a large range of engineering materials. The subject of mechanics of materials involves analytical methods for determining the strength, stiffness (deformation characteristics), and stability of the various members in a structural system. The behaviour of a member depends not only on the fundamental laws that govern the equilibrium of forces, but also on the mechanical characteristics of the material. These mechanical characteristics come from the laboratory, where materials are tested under accurately known forces and their behaviour is carefully observed and measured. For this reason, mechanics of materials is a blended science of experiment and Newtonian postulates of analytical mechanics.

Course outcomes:

On completion of the course, the student will be able to:

- Describe the theory of elasticity including strain/displacement and Hooke's law relationships.
- Assess variety of loading and forces in the determinate structural components.
- Assess variety of deformations in the determinate structural components.
- Analyze various situations involving structural members subjected to combined stresses by application of Mohr's circle of stress; locate the shear center of thin wall beams;
- Calculate the deflection at any point on a beam subjected to a combination of loads; solve for stresses and deflections of beams under unsymmetrical loading

COURSE CONTENT

INTRODUCTION TO SOLID MECHANICS	**SEMESTER**	**IV**

Teaching Scheme		**Examination Scheme**	
Lectures	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit I	**No. of Lectures: 09 Hours**	**Marks: 12**

Simple Stresses and Strains- Concept of simple stress and strain, shear stress, Hooke's law, and stress – strain relationship, bars of varying cross sections, statically indeterminate system, temperature stresses, Poisson's ratio, volumetric strain, elastic constants and relations between them.

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

(A)**Bending moment and Shear Force Diagrams**- Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported beams with or without overhangs and internal hinges. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads,

uniformly varying loads, and moments. Construction of loading diagrams and bending moment diagram from shear force diagram

(B)**Slope and deflection**- Relationship between moment, slope and deflection, Moment area method, Macaulay's method.

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

(A)**Torsion**- Theory of pure torsion, torsional moment of resistance, power transmitted by shafts, torsional rigidity, shear stresses in shafts due to torsion, stress & strain in determinate shafts of hollow or solid cross-sections,

(B)**Strain Energy and impact loading**: concept of strain energy, strain energy stored due to gradual, sudden and impact load.

Unit–IV	**No. of Lectures: 08 Hours**	**Marks: 12**

(A)Flexural Stresses-Theory of simple bending – Assumptions – Derivation of Pure bending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I section , Angle and Channel sections – Design of simple beam sections.

(B)Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

Unit–V	**No. of Lectures: 08 Hours**	**Marks: 12**

[A] **Axially loaded columns**: Euler's theory of long columns, assumptions made in Euler's theory, limitations of Euler's formula. Various end conditions & concept of equivalent length, Rankine's formula.

(B) **Direct & bending stresses** in short columns & other structural components due to eccentric or lateral loads, the middle third rule, core of section.

(C) **Principal stresses & strain**: Concept of principal stresses and planes, normal and tangential stress on any oblique plane, determination of principal stresses and principal planes, Mohr's circle method.

Text Books:

- Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.
- Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson

Prentice Hall

- Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill.
- Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf – TMH.
- Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.
- Strength of Materials by S Ramamrutham, Dhanpat Rai Publications.

Reference Books:

(i) Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.

Civil Engineering- societal and global impact

COURSE OUTLINE

Course Title:	Civil Engineering- societal and global impact	**Short Title:**	**CESGI**	**Course Code:**	**HSMC252**

Course description:

The course is designed to provide a better understanding of the impact which Civil Engineering has on the Society at large and on the global arena. Civil Engineering projects have an impact on the Infrastructure, Energy consumption and generation, Sustainability of the Environment, Aesthetics of the environment, Employment creation, Contribution to the GDP, and on a more perceptible level, the Quality of Life. It is important for the civil engineers to realise the impact which this field has and take appropriate precautions to ensure that the impact is not adverse but beneficial.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	3

Prerequisite course(s):

-

Course objectives:

To appreciate the student with the impact of development of civil engineering on the changing lifestyle, environmental degradation, resource depletion, economic stresses etc. Thus to appraise the students about the significance of sustainability.

Course outcomes:

After successful completion of this course the student will be able to know:

- The impact which Civil Engineering projects have on the Society at large and on the global arena and using resources efficiently and effectively.
- The extent of Infrastructure, its requirements for energy and how they are met: past, present and future
- The Sustainability of the Environment, including its Aesthetics,
- The potentials of Civil Engineering for Employment creation and its Contribution to the GDP
- Be precautions to be taken to ensure that the above-mentioned impacts are not adverse but beneficial.

COURSE CONTENT

Civil Engineering- societal and global impact		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Introduction to Course and Overview; Understanding the past to look into the future: Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution; Recent major Civil Engineering breakthroughs and innovations; Present day world and future projections, Ecosystems in Society and in Nature; the steady erosion in Sustainability; Global warming, its impact and possible causes; Evaluating future requirements for various resources; GIS and applications for monitoring systems; Human Development Index and Ecological Footprint of India Vs other countries and analysis;

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

Understanding the importance of Civil Engineering in shaping and impacting the world; The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for

Civil Engineering

Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground and underground cabling); Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability;

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Environment- Traditional & futuristic methods; Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability.

Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Built environment – Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Security systems; Intelligent/ Smart Buildings; Aesthetics of built environment, Role of Urban Arts Commissions; Conservation, Repairs & Rehabilitation of Structures & Heritage structures; Innovations and methodologies for ensuring Sustainability

Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**

Civil Engineering Projects – Environmental Impact Analysis procedures; Waste (materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects; New Project Management paradigms & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment(projects, facilities management), Quality of products, Health & Safety aspects for stakeholders;

Innovations and methodologies for ensuring Sustainability during Project development
Text Books:
-
Reference Books:

- *Ž iga* Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht

- Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition

- NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004.

- Allen M. (2008) Cleansing the city. Ohio University Press. Athens Ohio.

- Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A. (2010). London Tideway Tunnels Programme – Thames Tunnel Project Needs Report – Potential source control and SUDS applications: Land use and retrofit options

- http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx

- Ashley R M., Nowell R., Gersonius B., Walker L. (2011). Surface Water Management and Urban Green Infrastructure. Review of Current Knowledge. Foundation for Water Research FR/R0014

- Barry M. (2003) Corporate social responsibility – unworkable paradox or sustainable

paradigm? Proc ICE Engineering Sustainability 156. Sept Issue ES3 paper 13550. p 129-130

- Blackmore J M., Plant R A J. (2008). Risk and resilience to enhance sustainability with application to urban water systems. J. Water Resources Planning and Management. ASCE. Vol. 134, No. 3, May.

- Bogle D. (2010) UK's engineering Council guidance on sustainability. Proc ICE Engineering Sustainability 163. June Issue ES2 p61-63

- Brown R R., Ashley R M., Farrelly M. (2011). Political and Professional Agency Entrapment: An Agenda for Urban Water Research**.** Water Resources Management. Vol. 23, No.4. European Water Resources Association (EWRA) ISSN 0920-4741.

Computer-aided Civil Engineering Drawing Lab					
LAB COURSE OUTLINE					
Course Title:	**Computer-aided Civil Engineering Drawing Lab**	**Short Title:**	**CAED**	**Course Code:**	**ESC203**

Course description:

This course gives a practical exposure to the student regarding use of building palling principles in actual drawing of variety of residential buildings. It also trains the students regarding use of drafting assisting software.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	02	14	28	1

Prerequisite course(s):

Engineering graphics

Course objectives:

To train the student in drafting assisting software.

To enable the student to use the elements of building planning to draw a residential building

Course outcomes:

1. To be able to use advanced graphic tools for civil engineering drawings
2. To be able to prepare plans and elevations using graphic software.
3. To be able to prepare detailed drawings using software.
4. To be able to prepare perspective plans using software.
5. To be able to do scheduling of features of building components.

LAB COURSE CONTENT

Computer-aided Civil Engineering Drawing		**Semester:**	*IV*
Teaching Scheme:		**Examination scheme**	
Practical	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Sessional Exams (ISE):	**25 marks**

List of Drawing Experiments –

1. Sketching a simple residential house with given specifications. Sketch should include plan, elevation, side view, and site plan.
2. Drawing the above-mentioned plan using CAD software, showing furniture detials.
3. Showing electricity supply lines and plumbing lines in the plan using CAD software.
4. Developing foundation/column plan of the building CAD software.
5. Preparing working drawing of the building CAD software.
6. Preparing perspective drawing of the building CAD software.

Preparing line plans of one of the public building like school, college, hospital, bank, etc.

Students should learn some open source software to develop 3D structural model and do an assignment on it.

Text Books:

4. Building Drawing - M.G. Shah, C.M. Kale, S.Y. Patki - Tata Mcgraw Hills pvt. Ltd.New Delhi.
5. Y.S.Sane - Planning & Designing Building.
6. Building Science and Planning by S. V. Deodhar, Khanna Publihsers
4. National building Code

Reference Books:

- Subhash C Sharma & Gurucharan Singh, “Civil Engineering Drawing”, Standard Publishers
- Ajeet Singh, “Working with Auto CAD”, Tata- Mc Graw-Hill Company Limited, New Delhi
- Sham Tickoo Swapna D, “AUTOCAD for Engineers and Designers”, Pearson Education,
- Venugopal, “Engineering Drawing and Graphics + AUTOCAD”, New Age International Pvt. Ltd.,
- Balagopal and Prabhu, “Building Drawing and Detailing”, Spades publishing KDR building,

Calicut, (Corresponding set of) CAD Software Theory and User Manuals.

- Malik R.S., Meo, G.S. Civil Engineering Drawing, Computech Publication Ltd New Asian.
- Sikka, V.B., A Course in Civil Engineering Drawing, S.K.Kataria& Sons,

Introduction to Fluid Mechanics Lab					
LAB COURSE OUTLINE					
Course Title:	**Introduction to Fluid Mechanics Lab**	**Short Title:**	*IFML*	**Course Code:**	
Course description:					
This course provides an exposure to laboratory set up required for fluid characterization. It introduces with the methods of determination of basic properties of fluids required from civil engineering perspective.					
Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	
	2	14	28	3	
Prerequisite course(s):					
Mathematics					
Course objectives:					
The course is aimed to appreciate the student dealing with fluids in laboratory to characterize them and to determine their important civil engineering properties.					
Course outcomes:					
After successful completion of this course the student will be able to: o Understand the basic instrumental techniques used in fluid mechanics. o Understand how to characterize fluids o Be able to determine basic engineering properties of fluids.					
LAB COURSE CONTENT					
Introduction to Fluid Mechanics Lab		**Semester:**		**IV**	

Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous assessment (ICA)	**25 marks**

LIST OF PRACTICAL- Any seven experiments should be performed.

(i) Measurement of viscosity

(ii) Study of Pressure Measuring Devices

(iii) Stability of Floating Body

(iv) Reynolds Experiment

(v) Verification of Bernoulli's Theorem

(vi) Venturimeter

(vii) Coefficient of Orifice

(viii) Impacts of jets

Text Books:

- A Textbook of Fluid Mechanics and Hydraulic Machine by Dr. R K. Bansal, Laxmi Publications
- Fluid Mechanics and Fluid Power Engineering by D S Kumar, S K Kataria Publications.

Reference Books:

- Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
- Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
- Fluid Mechanics by Dr. A. K. Jain, Khanna Publishers, Delhi

Guide lines for ICA

The students must perform the experiments as prescribed in the syllabus and carryout the assignments given by the teacher. The term work should be assessed on regular bases.

Guide lines for ESE
The external sessional examination shall be a viva voce examination based upon the term work submitted by the students.

Materials, Testing & Evaluation II Lab					
LAB COURSE OUTLINE					
Course Title:	**Materials, Testing & Evaluation I Lab**	**Short Title:**	**MTE II**	**Course Code:**	
Course description:					
Civil engineering uses a variety of materials for a variety of construction works. Testing of soil is very crucial in civil engineering as it assists in deciding the foundation design. The testing of highway payment materials is also an important aspect include in this syllabus.					
	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**	
Laboratory	2	14	28	1	
Prerequisite course(s):					
-					
Course objectives:					
The objective of this Course is to train the student to characterize the civil engineering materials, and to confirm their suitability for variety of construction works as per relevant IS specifications. The focus in the present syllabus is on soil testing and flexible pavement material testing.					
Course outcomes:					

The student must:

1. Know the important properties of materials used in pavement construction.
2. Be aware about the relevant IS specifications for soils and flexible pavement materials.
3. Should be able to handle the equipments used for material testing in pavement construction
4. Must be able to characterize variety of soils and flexible pavement materials.
5. Should be able to design pavements of highways.

LAB COURSE CONTENT

Materials, Testing & Evaluation II Lab		**Semester:**	*IV*
Teaching Scheme:		**Examination scheme**	
Practical	**2 hours/week**	**End semester exam (ESE):**	**25**
		Internal Continuous Assessment (ICA)	**25**

List of Practical

1. Tests on bitumen: Penetration test, ductility of bitumen test, softening point test, flash and fire point test, viscosity of bitumen, specific gravity of bitumen, bitumen extraction test on premix sample.
2. Bitumen mix design.
3. Visit to hot mix plant, or/and road construction site.
4. Tests on timber: bending strength, moisture content.
5. Tensile strength of mild steel, torsion test of steel/aluminum.

Text Books

1. Basic and Applied Soil Mechanics, A S R Rao, Wiley Eastern Publication.
2. Soil Mechanics and Foundation, P N Modi, Standard Book House publications.
3. Highway Engineering: Pavements, Materials and Control of Quality, Athanassios Nikolaides, CRC publications.

Reference Books:
-
Guidelines for ICA
The student must perform all the above mentioned practical and submit in the form of journal. Site visit is desirable.
Guidelines for ESE
the ESE must be in the form of oral examination. The student must be able to answer questions based upon the journal submitted by him/her, site visit report and the assignment.

Engineering Geology Lab					
LAB COURSE OUTLINE					
Course Title:	**Engineering Geology Lab**	**Short Title:**	*EG*	**Course Code:**	
Course description:					
This course is designed to enable students to evaluate, apply and to analyze the relevant geological principles. In this course the related topics on rock type, classification, geological structures and geological processes are covered .The principles of structural geology are introduced mainly to highlight the relevancy of engineering properties of geological materials in designing rock engineering projects. At the end of the course students, acquainted with related knowledge and principles in geology and can be able to apply these knowledge and principle in designing safe and economic engineering structures in rock masses.					

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Theory	01	14	14	02
Laboratory	*02*	*14*	*28*	2

Prerequisite course(s):
Physics ,Chemistry, Math, elements of civil engineering and surveying-I
Course objectives:
The objective of this Course is to focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation. Through lectures, labs, and case study examination student will learn to couple geologic expertise with the

engineering properties of rock and unconsolidated materials in the characterization of geologic sites for civil work projects and the quantification of processes such as rock slides, soil-slope stability, settlement, and liquefaction.

Engineering geology is an applied geology discipline that involves the collection, analysis, and interpretation of geological data and information required for the safe development of civil works. Engineering geology also includes the assessment and mitigation of geologic hazards such earthquakes, landslides, flooding; the assessment of timber harvesting impacts; and groundwater remediation and resource evaluation. Engineering geologists are applied geoscientists with an awareness of engineering principles and practice—they are not engineers.

Course outcomes:

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

(i) Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice

(ii) The fundamentals of the engineering properties of Earth materials and fluids.

(iii) Rock mass characterization and the mechanics of planar rock slides and topples.

(iv) Soil characterization and the Unified Soil Classification System.

(v) The mechanics of soils and fluids and their influence on settlement, liquefaction, and soil slope stability.

LAB COURSE CONTENT

Engineering Geology Lab		**Semester:**	*IV*
Teaching Scheme:		**Examination scheme**	
Theory:	**1 hours/week**	**End semester exam (ESE):**	**25**
Practical:	**2 hours/week**	**Internal Sessional Exams (ICA:**	**25**

Mineralogy- Mineral, Origin and composition. Physical properties of minerals, Rock forming minerals, megascopic identification of common primary & secondary minerals. Felic and mafic , essentional and accessories minerals.

Petrology-Rock forming processes.. Chemical and Mineralogical Composition. Texture and structures , classification. Sedimentary petrology- mode of formation, Mineralogical Composition. Texture and its types, Structures, Gradation of Clastic rocks. Classification of sedimentary rocks and their characteristics., Metamorphic petrology- Agents and types of metamorphism, metamorphic grades, Mineralogical composition, structures in metamorphic rocks. Important Distinguishing features of rocks as Rock cleavage, Schistosity, Foliation. Classification.

Physical Geology- Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering: Geological action of river , river stages and its characters , Water fall and Gorges, River meandering, river rejuvenation.

Structural Geology Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold- Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.

Geology of dam and reservoir site- Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures. Dams on various rocks and geological structures and its engineering imporantance .

Geological Hazards- Rock Instability and Slope movement: Concept of sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. . Types of landslide. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment

. **Following experiments are to be performed. Term works shall consist of journal giving details of the experiments performed.**

1. Identification of following minerals in hand specimens.
   Quartz and its varieties, common varieties of cryptocrystalline and amorphous silica, orthoclase, plagioclase, muscovite, biotite, zeolites, calcite, gypsum, fluorite, barites, tourmaline, beryl, asbestos, talc, kyanite, garnet, galena, magnetite, haematite,

limonite, iron pyrites, chromite, bauxite.

a. To know chemical composition of mineral.
b. To know Mohs Scale of Hardness of standard minerals.
c. To identify color, streak, cleavage, fracture, luster, hardness, crystal form etc.
d. To identify special property of mineral
e. Identify mineral name based on physical properties.

2. Identification of following different rock types in hand specimens.

   Granites, Syenites, Diorites, Gabbros, Rhyolites, Trachytes, Andesites, Basalts, Varieties of Deccan Trap rock, Volcanic breccias, Pegmatites, Dolerites, Graphic granites, Laterites, Bauxites, Conglomrates, Breccias, Sand stones, Quatzites, Grits, Arkose, Shales, Chemical and organic lime stone. Marbles, Quartzites, Varieties of Gneisses, Slates, Phyllites and varieties of Schists.

   a. To know colour, texture/structure of rock specimen
   b. To identify mineral composition of rock specimen
   c. Based on mineral composition classify rock specimen.
   d. Identify rock name based on properties.

3. Construction of geological section from contoured geological maps.
   a. To draw geological section from geological contour map.
   b. To identify various structural features such faults, folds, joints, dykes etc. from the section.
   c. To identify the nature of topography below the ground level.
4. Interpreting geological features without drawing section
   a. To identify geological features without drawing section
   b. Identifying faults, folds, joints, divisional planes etc.
5. Solution of engineering geological problems such as alignment of dam, tunnels, roads, canals, bridges, etc. based on geological maps.
   a. To draw the geological section from contour geological map
   b. To find out the solution of geological problems based on geological maps.
   c. To find the alternative solution or exact solution related to geological problems.

6. Logging of drill core and interpretation of drilling data with graphical representation of

core log.

a. To represent the Core-Box data in the form of Core-log & representing the same in the form of Graph by using Litholog OR

b. To solve Numerical based on core data with graphical representation of core-log.

7. One site visit is desirable to study geology and its engineering applications, submission of field report.

Text Books:

- .Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.
- Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
- Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

Reference Books:

1 R.B. Gupte : A Text Book of Engineering Geology -P.V.G. Publications, Pune.

2 M. Anji Reddy : A Text Book of Remote Sensing and Geographical Information Systems by - 2nd Edition B S Publication.

3 R.Legget : Geology and Engineering - McGraw Hill Book Co., London.

4 Arthur Holmes : Physical Geology -ELBS Publication.

5 Tony Waltham : Fundamentals of Engineering Geology, SPON Press.

6 J.M. Treteth : Geology of Engineers, Princeton, Von. Nostrand.

7 K V G K Gokhale : Text Book of Engineering Geology, B S Publication

Environmental Studies					
COURSE OUTLINE					
Course Title:	**Environmental Studies**	**Short Title:**	**EVS**	**Course Code:**	**Non Credit**
Course description:					
The course aims to percolate the importance of environmental science and environmental studies.					
COURSE CONTENT					
Environmental Studies		**Semester:**	**IV**		
		Examination scheme			
		End Semester Exam (ESE):		**60 marks**	
		Duration of ESE:		**03 hours**	
		Internal Continuous Assessment (ICA):		**40 marks**	
Unit–I:	**No. of Lectures: 02 Hours**				
Multidisciplinary nature of environmental science Definition, scope and importance Need for public awareness.					

Unit–II:	No. of Lectures: 08 Hours	

Natural Resources :

Renewable and non-renewable resources

Natural resources and associated problems.

a. Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d. Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
f. Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

• Role of an individual in conservation of natural resources.

• Equitable use of resources for sustainable lifestyles.

Unit–III:	No. of Lectures: 06 Hours	

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of thefollowing ecosystem :-

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit–IV:	No. of Lectures: 08 Hours	

Biodiversity and its conservation

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographic classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aestheticand option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit–V:	No. of Lectures: 08 Hours	

Environmental Pollution

Definition

- Cause, effects and control measures of :-
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear hazards
- Solid waste Management : Causes, effects and control measures of urban andindustrial

wastes.

- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disastermanagement : floods, earthquake, cyclone and landslides.

Unit–VI:	No. of Lectures: 07 Hours	

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. CaseStudies
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear
- accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit–VII:	No. of Lectures: 06 Hours	

Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Program
- Environment and human health.
- Human Rights.

- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit–VIII:	No. of Lectures:	

Field work

- Visit to a local area to document environmental assets, river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5lecture hours)

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)

8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev.,Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay NaturalHistory Society, Bombay (R)
10. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment.Cambridge Univ. Press 1140p.
11. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws.Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems &Solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
16. Rao M N. &Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ.Co. Pvt. Ltd. 345p.
17. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)
19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, BlackwellScience (TB)

Internship - I

Internship is a mandatory and non-credit course. It is mandatory for all admitted students to undergo Internship during the degree course. The course Internship – I shall be of THREE weeks duration during summer vacation after Semester - IV. Following are the intended objectives of internship training:

- To expose students to the real world and to enhance professional competencies in them.
- To provide opportunities to develop technical/managerial skills required at the job, in real time.
- To exposure to the current technological developments relevant to the subject area of training.
- To learn the application of theoretical knowledge they have acquired.

Students shall choose to undergo Training/Innovation/Entrepreneurship/on site learning related activities for Internship. Students shall choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/NGO's/Government organizations/Micro/ Small/Medium enterprises/academic institutions / research institutions. In

case student want to pursue internship by engaging his/her family business, a declaration by the parent should be submitted to the Department's Head.

During the last year of FOUR year Bachelor of Engineering course, the student should take project work, as specified in the curriculum, based on the knowledge acquired by the student during the degree course and during Internship. The project work provides an opportunity to build a system based on area where the student likes to acquire specialized skills. The work may also be on specified task or project assigned to the student during Internship.
The internship activities and list of sub-activities for Internship – I are as under.

- Inter/Intra Institutional Activities:
    - Training with higher Institutions such as IITs, NITs, University Departments, Recognized Research Labs etc.
    - Soft skill training organized by Training and Placement Cell of the respective institutions
    - Online certification courses by SWAYAM, NPTEL, QEEE etc.
    - Learning at Departmental Lab/Tinkering Lab/ Institutional workshop
    - Working for consultancy/ research project within the institutes
    - Training on Software
    - Field Survey/Case Study
- Internship al fresco :
    - Technical training with Industry/Govt./NGO/PSU/Any Micro/Small/Medium enterprise/academic institutions/research institutions
    - Online Internship
    - On site working
    - Working in office where relevant technical assignments are available.

Each faculty Mentor/Supervisors has to play active roles during the internship and maximum 20 students are to be supervised a faculty mentor. Mentor shall ensure non repetition of activities by the student under internship. The college/Institute shall also facilitate internship for the students.

Every student is required to prepare a file for Internship – I containing documentary proofs (daily training diary, comprehensive report and completion certificate) of the activities done by him/her. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students. The daily training diary should include Date, Time of Arrival, Time of Departure, Main activities of the day. The daily training diary should be signed by the supervisor and in charge of the section where the student has been working.

After completion of Internship, the student should prepare a report to indicate what s/he has learnt in the training period. The report should include Internship Activities, and Internship Outcome.

The completion certificate should be signed by the supervisor/ in charge of the section where the student has been working with performance remark as Poor/Satisfactory/Good /Excellent.

The evaluation of Internship – I shall be in Semester – V. The evaluation shall be done by committee constituted by the concerned department including Department Head, Department's training and placement coordinator and faculty mentor. It should be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Proper write-up.

The satisfactory completion of Internship – I shall be submitted to the university at the end of Semester - VIII of FOUR year Bachelor of Engineering course. Only after successfully completion of Internship- I (during summer vacation after Semester – IV) and Internship- II (during summer vacation after Semester – VI), Internship should be printed in the final year mark sheet as COMPLETED.