As per AICTE guidelines

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. 2018 – 19

As per AICTE guidelines

As per AICTE guidelines

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

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
Basic Electronics	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
Basic Electronics Lab	C	-	-	2	2	-	-	25	25 OR	50	1
Surveying and Geomatics Lab	D	-	-	2	2	-	-	25	25 PR	50	1
Material, Testing & Evaluation Lab I	D	1	-	2	3	-	-	25	25 OR	50	2
		16	**1**	**6**	**23**	**200**	**300**	75	**75**	**650**	**20**

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:

- Students will understand the structures and characteristics or functions of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
- Students will learn the basic principles of inheritance at the molecular, cellular and Organism levels.
- 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:

- Use current techniques and analysis methods in molecular biology and genetics.
- Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
- Know the structure/function of the basic components of prokaryotic and eukaryotic

cells including macromolecules and organelles.

- 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: 08 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: 08 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.		

As per AICTE guidelines

Text Books:
• B.D. Singh " Genetics" Kalyani Publications Third Edition. • C.B. Pawar"Cell Biology" Himalaya Publications, Third Edition. • C.B. Pawar"Cell and Molecular Biology" Himalaya Publications. • Text book of Zoology by V.K. Agrawal, S. Chand Publication. • Text book of Botany by Dr. B.P. Pandey S. Chand Publication. • Text book of Biotechnology by R.C. Dubey, S. Chand Publications.
Reference Books:
• P. K Gupta, Introduction to Biotechnology, Rastogi Publications. • B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008. • S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.

Basic Electronics					
COURSE OUTLINE					
Course Title	Basic Electronics	**Short Title**	BE	**Corse Code**	
Course Description: Second Year III Semester Civil Engineering					
The objective of this Course is to provide the students with an introductory and broad treatment of the field of *Electronics Engineering to facilitate better understanding of the devices, instruments and sensors used in Civil Engineering applications.*					
Lecture	**Hours/week**	**No. of weeks**	**Total Hours**	**Semester Credit**	
	3	14	42	3	
Prerequisite course(s):					
Physics					
Course objective:					
• To make aware the student about the concepts and functionalities of the electronic devices, tools and instruments • To make student familiar with uses, general specifications and deployabilities of the electronic devices, and assemblies.					
Course Outcomes:					
After successful completion of this course this student will be able to • Appreciate the concepts and functionalities of the electronic devices, tools and instruments • Understand use, general specifications and deployabilities of the electronic devices, and assemblies					
COURSE CONTENT					
Basic Electronics		**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:** 08 Hours	**Marks:**12
Diodes and Applications covering, Semiconductor Diode - Ideal versus Practical, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave bridge Rectifiers,Capacitor filter, Breakdown Mechanisms, Zener Diode, Opto-Electronic Devices – LEDs, Photo Diode, Silicon Controlled Rectifier (SCR) – Operation, Construction, Characteristics.		
Unit II	**No. of Lectures:** 08 Hours	**Marks:**12
Basic Structural Analysis: *Transistor Characteristics* covering, Bipolar Junction Transistor (BJT) – Different configurations, their dc current gains and regions of operation, Operating Point, Voltage Divider Bias Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits.		
Unit III	**No. of Lectures:** 08 Hours	**Marks:**12
Transistor Amplifiers and Oscillators covering, Classification, Small Signal Amplifier Analysis of CE,CB,CC configurations using h-parameters, Oscillators – Classification, RC Phase Shift, Wien Bridge, LC Oscillators.		
Unit IV	**No. of Lectures:** 08 Hours	**Marks:**12
Operational Amplifiers and Applications covering, Introduction to Op-Amp, Differential Amplifier Configurations-DC & AC Analysis, Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal OpAmp, Concept of Virtual Ground;OPAMP Applications-Inverting, Non-Inverting, Adder,Subtractor		
Unit V	**No. of Lectures:** 08 Hours	**Marks:**12
Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT and DIP), Bread Boards and Printed Circuit Boards (PCBs); Identification, Specifications, Testing of Active Devices – Diodes, BJTs, JFETs, MOSFETs, Power Transistors, SCRs and LEDs;.		

As per AICTE guidelines

Text Books:
• David. A. Bell (2003), *Laboratory Manual for Electronic Devices and Circuits*, Prentice Hall, India • Santiram Kal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India • Thomas L. Floyd and R. P. Jain (2009), *Digital Fundamentals* by Pearson Education, • Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), *Basic Electronics – A Text-Lab. Manual,* TMH • R. T. Paynter (2009), *Introductory Electronic Devices & Circuits, Conventional Flow Version,* Pearson
Reference Book:
• Basic Electronics by D P Kothari, Tata McGraw Hills Publications. • Basic Electronics by Ghatak and De, Pearson Publications.

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

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.
- To enable the student to 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.
- To appreciate the Energy conservation methods with emphasis from Civil Engineering

perspective.

- To acquire a knowledge base 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:

- The student will be able to understand the importance of energy resources.
- The student will appreciate the impact of global energy crises.
- The student will recognize the role of engineers in energy management.
- The student will understand the concept of energy efficiency, importance of alternative energy sources, applications of energy efficiency 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: 08 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: 08 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.		

As per AICTE guidelines

Text Books:
• Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press • Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press • Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
Reference Books:
• Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII, • Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley • 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 & Geomatics					
COURSE OUTLINE					
Course Title:	**Surveying and Geomatics**	**Short Title:**	*SUR &G*	**Course Code:**	

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

- Basic principles of surveying and important aspect of leveling.
- Engineering surveys such as profile leveling and cross sectioning
- Measurement of horizontal and vertical angle ,magnetic bearings, deflection angle by using theodolite
- Traverse computation- consecutive and independent coordinates.
- Tachometric surveying- measurement of horizontal and vertical distances,tacheometric
- contouring
- Plane table survey
- 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:

- Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities
- Translate the knowledge gained for the implementation of Civil infrastructure facilities
- Relate the knowledge on Surveying to the new frontiers of science like Hydrographic surveying, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing

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: 08 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: 06 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:

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

Reference Books:

- Surveying and Leveling (Vol – I & II) by T. P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune.

- Surveying Vol. I and Vol. II by B. C. Punmia, Laxmi Publication (P) New Delhi.
- Principles of surveying by Cliver and Clendening
- Advance surveying, Vol. I & II, Handbook by P.B. Shahani
- A handbook of accurate surveying methods by S. P. Collins

Introduction To Civil Engineering

COURSE OUTLINE

Course Title:	**Introduction To Civil Engineering**	**Short Title:**	**ICE**	**Course Code:**	

Course description:

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.

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

Prerequisite course(s):

-

Course objectives:

- 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.

Course outcomes:

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

The course outcomes can be summarized as follows:

- Introduction to what constitutes Civil Engineering
- Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering
- Highlighting the depth of engagement possible within each of these areas
- Exploration of the various possibilities of a career in this field
- Understanding the vast interfaces this field has with the society at large
- Providing inspiration for doing creative and innovative work
- Showcasing the many monuments, heritage structures, nationally important infrastructure, and impressive projects to serve as sources of inspiration
- 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.

<table>
<tr><td colspan="6">Basic Electronics Lab</td></tr>
<tr><td colspan="6">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title</td><td>Basic Electronics</td><td>Short Title</td><td>BE</td><td>Corse Code</td><td>ESC202</td></tr>
<tr><td colspan="6">Course Description: Second Year III Semester Civil Engineering</td></tr>
<tr><td colspan="6">The objective of this course is to provide the students with an introductory and broad treatment with the working of electronic devices used in civil engineering practices, their uses, their applications and their limitations.</td></tr>
<tr><td rowspan="2">Laboratory</td><td>Hours/week</td><td>No. of weeks</td><td>Total Hours</td><td colspan="2">Semester Credit</td></tr>
<tr><td>2</td><td>14</td><td>28</td><td colspan="2">1</td></tr>
<tr><td>end Semester Examination Pattern (ESE)</td><td colspan="5">Oral</td></tr>
<tr><td colspan="6">Prerequisite course(s):</td></tr>
<tr><td colspan="6">Physics</td></tr>
<tr><td colspan="6">Course objective:</td></tr>
<tr><td colspan="6">• To make aware the student about the concepts and functionalities of the electronic devices, tools and instruments
• To make student familiar with uses, general specifications and deployabilities of the electronic devices, and assemblies.
• To develop confidence in handling and usage of electronic devices, tools and instruments in engineering applications</td></tr>
</table>

Course Outcomes:

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

- Appreciate the concepts and functionalities of the electronic devices, tools and instruments
- Understand use, general specifications and deployabilities of the electronic devices, and assemblies
- Have confidence in handling and usage of electronic devices, tools and instruments in engineering applications

LAB COURSE CONTENT			
Basic Electronics		**Semester**	III
Teaching Scheme		**Examination Scheme**	
Practical:	2 hours/week	**End Semester Exam (ESE):**	25 Marks
		Internal Continuous Assessment	25 Marks

List of Practicals:

- Identification and testing of R,L,C, Diode, BJT & FET.
- Study of operation of DMM, Function generator, CRO & Power supply.
- V-I characteristics of P-N Junction diode.
- V-I characteristics of zener diode.
- Input & Output characteristics of CE configuration.
- Drain & Transfer characteristics of CS-JFET.

As per AICTE guidelines

Text Books:
• David. A. Bell (2003), *Laboratory Manual for Electronic Devices and Circuits*, Prentice Hall, India • Santiram Kal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India • Thomas L. Floyd and R. P. Jain (2009), *Digital Fundamentals* by Pearson Education, • Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), *Basic Electronics – A Text-Lab. Manual,* TMH • R. T. Paynter (2009), *Introductory Electronic Devices & Circuits, Conventional Flow Version,* Pearson
Reference Book:
-
Guidelines for ICA
The ICA should be a continuous assessment throughout the semester based upon the list of experiments the student has to perform in the laboratory.
Guide lines for ESE
The ESE should be an Oral exam based upon the term work submitted by the student.

Surveying and Geomatics LAB					
LAB COURSE OUTLINE					
Course Title:	**Surveying and Geomatics Lab**	**Short Title:**	*SUR &G*	**Course Code:**	

Course description:

- Measurement of horizontal and vertical angle ,magnetic bearings, deflection angle by using theodolite.
- Traverse computation- consecutive and independent coordinates.
- Tachometric surveying- measurement of horizontal and vertical distances, tacheometric contouring
- 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:

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

Course outcomes:

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

- Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities
- Translate the knowledge gained for the implementation of Civil infrastructure facilities

- Relate the knowledge on Surveying to the new frontiers of science like Hydrographic surveying, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing

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

- 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

- 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).
- Practical Surveying and Computations, Second Edition 2nd Edition by A L Allan, Butterworth-Heinemann; 2 edition (October 8, 1997).
- Practical Marine Surveying by Harry Phelps (Author) BiblioLife (March 19, 2009).
- 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:

- Field book containing record of all exercises and projects listed above.
- File of full imperial size drawing sheets as mentioned below
- Theodolite Traverse survey project. 1 sheet
- Tachometric contouring project……..1 sheet
- Road project showing L- section, plan of road and typical cross -section…….Min -1 sheet
- 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 examination

Materials, Testing & Evaluation I Lab					
LAB COURSE OUTLINE					
Course Title:	**Materials, Testing & Evaluation I Lab**	**Short Title:**	**MTE I**	**Course Code:**	

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:

- To train the student to characterize the civil engineering materials.
- To enable the student to confirm the material suitability for variety of construction works as per relevant IS specifications.

Course outcomes:

The student will:

- Know the relevant IS specifications for various construction materials.
- Will be able to characterize variety of civil engineering material as per IS specifications.

Guidelines for ICA

The ICA should be a continuous assessment throughout the semester based upon the list of experiments the student has to perform in the laboratory.

Guidelines for ESE

There must be Oral examination based upon the experimental work done by the student.

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

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

Reference Books:

- Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
- Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition

- Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materialsused for Civil Engineering applications
- Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
- E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition
- 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.

As per AICTE guidelines

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. 2018 – 19

As per AICTE guidelines

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

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 Drawing Lab	C	-	-	2	2	-	-	-	-	-	1
Introduction to Fluid Mechanics Lab	D	-	-	2	2	-	-	25	25 OR	50	1
Material, Testing & Evaluation Lab II	D	-	-	2	2	-	-	25	25 OR	50	1
Engineering Geology	D	1	-	2	3	-	-	25	25 PR	50	2
Environmental Science*	H	-	-	-	-	20	80	-	-	100	-
		16	**1**	**8**	**25**	**200**	**300**	**75**	**75**	**650**	**21**

* Only for students coming laterally (after diploma)

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

MATHEMATICS-III					
COURSE OUTLINE					
Course Title:	**Mathematics –III**	**Short Title:**	**M-III**	**Course Code:**	BSC201

Course description:

This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from first year engineering or diploma and familiarity with various laws, principles and theories of probability and statistics. The goals of the course are to understand the basic principle of Transforms, probability, statistics and its application in Engineering Field.

Lecture 03	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	4	10	40	3
Tutorial 01	1	14	14	1

Prerequisite course(s): 11^{th}& 12^{th} mathematics

Course objectives:

The objective of this course is to familiarize the prospective engineers with techniques in Laplace Transform , Fourier and Z-transform. 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:

After successful completion of this course, Students will be able to solve field problems in engineering involving ordinary differential equations using Laplace Transform. They can also formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.

COURSE CONTENT			
Mathematics -II1		**Semester:**	**IV**
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: 08 Hours**	**Marks: 12**

Laplace Transform: Properties of Laplace Transform, Inverse Laplace transform, Convolution theorem. Evaluation of integrals by Laplace transform, solving ordinary differential equations by Laplace Transform.

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

Fourier Transform and Z-transform

Fourier sine and cosine integrals, Fourier sine transform, Fourier cosine transform, Inverse Fourier transform.

Z – Transform**:** Definition, Region of convergence, Properties of Z-Transform, Inverse Z-Transform.

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

Basic Statistics:

Introduction to measures of central tendency, Moments, skewness and Kurtosis, Correlation and regression, Binomial, Poisson and Normal distributions.

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 exponential curves,

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means.

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

Small samples:

Small sample test for single mean, difference of means , test for ratio of variances, F-test for equality of population variances, Chi-square test for goodness of fit and independence of attributes.

Text Books

(i) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010,2016

(ii) H.K.DASS "Advance Engineering Mathematics" S. Chand publications. Fifteenth revised edition 2006.

(iii) S. C. Gupta "Fundamentals of Statistics", Himalaya Publishing House ,sixth revised edition 2008.

(iv) Debashis Datta "Textbook of Engineering Mathematics'' 'New Age International Publication. Revised second edition

---

Reference Books :

(i) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

(ii) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006..

(iii) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

(iv) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

(v) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

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 student will be able to work with a graphic assisting software student will also be able to develop a building plan, elevation, side view, site view and working drawing using software for a given set of specifications.					

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: 08 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: 08 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:

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

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 and Kinematics and Dynamics of fluid flow. The course deals with theoretical concepts as well introduces with numerical approaches also.

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

Prerequisite course(s):

Mathematics

Course objectives:

- To learn fluid and flow properties
- To analyze and solve fluid problems under static and dynamic conditions.
- To know about measurement of pressure, computations of hydrostatic forces on structural components and the concepts of Buoyancy and find useful applications in many engineering problems.

Course outcomes:

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

o Understand the broad principles of fluid statics, kinematics and dynamics o Understand definitions of the basic terms used in fluid mechanic o 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: 08 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: 08 Hours**	**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 SOLIDS MECHANICS					
COURSE OUTLINE					
Course Title:	**INTRODUCTION TO SOLIDS MECHANICS**	**Short Title:**	*ISM*	**Course Code:**	
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.					
Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	
	3	14	42	3	
Prerequisite course(s):					
-					
Course objectives:					
• To introduce to continuum mechanics and material modeling of engineering materials. • To appraise with first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds; plasticity and yield design. • To introduce with the unified mechanistic language using thermodynamics, which allows understanding, modeling and design of a large range of engineering materials. • To understand the behavior of a member under equilibrium of forces.					

Course outcomes:

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

- Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, relative to the strength and stability of structures and mechanical components;
- Define the characteristics and calculate the magnitude of combined stresses in individual members and complete structures; analyze solid mechanics problems using classical methods and energy methods;
- 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;and
- 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; apply various failure criteria for general stress states at points; solve torsion problems in bars and thin walled members;

Introduction to Solid 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: 08 Hours**	**Marks: 12**

Simple Stresses and Strains- Concept of stress and strain, , Types of stresses and strains, Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience – Gradual, sudden, impact loadings.

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

Compound Stresses and Strains- Two dimensional system, stress at a point on a plane, principal

stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Bending moment and Shear Force Diagrams- Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. 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, application of moments. Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Flexural Stresses-Theory of simple bending – Assumptions – Derivation of 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,T section, Angle and Channel sections – Design of simple beam sections. *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**
Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs. Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.		

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, 2004
- Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979
- Laboratory Manual of Testing Materials - William Kendrick Hall
- Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf
  - TMH 2002.
- Strength of Materials by R. Subramanian, Oxford University Press,New Delhi.
- E. P .Popov - Mechanics of Solids
- V.L.Shah - Strength of Materials
- Ramamrutham - Strength of Materials

Reference Books:

- 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 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.
- 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
- The Built Environment and factors impacting the Quality of Life.
- The precautions to be taken to ensure that the above-mentioned impacts are not adverse but beneficial.
- Applying professional and responsible judgment and take a leadership role;

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: 08 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: 08 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:**	

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:

- To develop graphical skills for communicating concepts, ideas and designs of engineering products.
- To have ability to understand another person's designs.
- To get exposure to national standards relating to technical drawings.
- To have practice of using Computer Aided Drafting using popular software.

LAB COURSE CONTENT

Computer-aided Civil Engineering Drawing Lab		**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:

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

Guidelines for ICA

The ICA should be a continuous assessment throughout the semester based upon the list of experiments the student has to perform in the laboratory.

Guidelines for ISE

There must be a Oral exam based upon the list of experiments the student has performed in the laboratory.

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	1

Prerequisite course(s):

Mathematics

Course objectives:

- To enable the student dealing with fluids in laboratory
- To characterize fluids and to determine their important civil engineering properties.

Course outcomes:

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

- Understand the basic instrumental techniques used in fluid mechanics.
- Understand how to characterize fluids
- 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.

- Measurement of viscosity
- Study of Pressure Measuring Devices
- Stability of Floating Body
- Hydrostatics Force on Flat Surfaces/Curved Surfaces
- Verification of Bernoulli's Theorem
- Venturimeter
- Orifice meter
- Impacts of jets

Text Books:

- http://geeta.edu.in/Mechanical_Data/labmanual/Fluid%20Mechanics%20lab%20manual.pdf

Reference Books:

- -

Guide lines for ICA

The ICA work shall include the list of experiments to be performed in the laboratory. The students may be asked to do suitable assignments also specially for practicing on

numerical problems.
Guide lines for ESE
The ESE shall be Oral examination, based upon the ICA submission file submitted by the students.

Materials, Testing & Evaluation II Lab					
LAB COURSE OUTLINE					
Course Title:	**Materials, Testing & Evaluation II 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:					
• To train the student to characterize the civil engineering materials. • To confirm the material suitability for variety of construction works as per relevant IS specifications; with special focus on soil testing and flexible pavement material testing.					
Course outcomes:					
The student must: • Know the relevant IS specifications for soils and flexible pavement materials. • Must be able to characterize variety of soils and flexible pavement materials.					

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

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.
- Bitumen mix design.
- Assignment on design on flexible pavement and rigid pavement.
- Visit to hot mix plant, or/and road construction site.

Tests on soil (any five):

- Sieve analysis, plastic limit, liquid limit, shrinkage limit
- Permeability test,
- Vane shear test.
- Determination of BC by Terzaghi's Method.
- Study of Plate Load Test/SPT Test.
- Soil consolidation test.

Text Books

- Basic and Applied Soil Mechanics, A S R Rao, Wiley Eastern Publication.
- Soil Mechanics and Foundation, P N Modi, Standard Book House publications.

• 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):

-

Course objectives:

- To focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation.
- To be able to couple geologic expertise with the engineering properties of rock and unconsolidated materials.
- To be able to explore geologic sites for civil work projects and the quantification of

processes such as rock slides, soil-slope stability, settlement, and liquefaction.

- To understand the collection, analysis, and interpretation of geological data and information required for the safe development of civil works.
- To be able in assessment and mitigation of geologic hazards such earthquakes, landslides, flooding; the assessment of timber harvesting impacts; and groundwater remediation and resource evaluation.

Course outcomes:

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

- Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice
- The fundamentals of the engineering properties of Earth materials and fluids.
- Rock mass characterization and the mechanics of planar rock slides and topples.
- Soil characterization and the Unified Soil Classification System.
- 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.**

- 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.

- 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.

- 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.
- Interpreting geological features without drawing section
  a. To identify geological features without drawing section
  b. Identifying faults, folds, joints, divisional planes etc.
- 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.

- 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.

- 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:

- R.B. Gupte : A Text Book of Engineering Geology -P.V.G. Publications, Pune.
- M. Anji Reddy : A Text Book of Remote Sensing and Geographical Information Systems by 2nd Edition B S Publication.
- R.Legget : Geology and Engineering - McGraw Hill Book Co., London.
- Arthur Holmes : Physical Geology -ELBS Publication.
- Tony Waltham : Fundamentals of Engineering Geology, SPON Press.
- J.M. Treteth : Geology of Engineers, Princeton, Von. Nostrand.
- K V G K Gokhale : Text Book of Engineering Geology, B S Publication

Guidelines for ICA

The ICA should be a continuous assessment throughout the semester based upon the list of experiments the student has to perform in the laboratory.

Guidelines for ISE

There must be a Oral examination based upon the list of experiments the student has performed during the session.

Environmental Sciences					
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):	**80 marks**		
		Duration of ESE:	**03 hours**		
		Internal Continuous Assessment (ICA):	**20 marks**		
Unit–I:	**No. of Lectures: 02 Hours**				
Multidisciplinary nature of environmental studies 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:

- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
- De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- Down to Earth, Centre for Science and Environment (R)
- Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev.,Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
- Hawkins R.E., Encyclopedia of Indian Natural History, Bombay NaturalHistory Society, Bombay (R)
- Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment.Cambridge Univ. Press 1140p.
- Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws.Himalaya Pub. House, Delhi 284 p.
- Mckinney, M.L. & School, R.M. 1996. Environmental Science systems &Solutions, Web

enhanced edition. 639p.

- Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
- Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
- Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
- Rao M N. &Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ.Co. Pvt. Ltd. 345p.
- Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
- Survey of the Environment, The Hindu (M)
- Townsend C., Harper J, and Michael Begon, Essentials of Ecology, BlackwellScience (TB)