Semester –III								
Course Code	**Course Name**	**Schedule of Teaching**			**Evaluation Scheme**			**Credits**
		L	**T**	**P**	**Int.**	**Ext.**	**Total**	
BECEE0-001	Basic Electronics	1	0	0	40	60	100	1
BCIES1-301	Computer-aided Civil Engineering Drawing	1	0	0	40	60	100	1
BCIES1-302	Energy Science & Engineering	2	0	0	40	60	100	2
BCIES1-303	Surveying	2	0	0	40	60	100	2
BMECE0-001	Engineering Mechanics	3	1	0	40	60	100	4
BMATH4-301	Mathematics-III (Transform & Discrete Mathematics)	2	0	0	40	60	100	2
BHSMC0-005	Humanities-I (Effective Technical Communication)	3	0	0	40	60	100	3
BHSMC0-021	Introduction to Civil Engineering	3	0	0	40	60	100	3
BECEE0-002	Basic Electronics Lab	0	0	2	60	40	100	1
BCIES1-304	Computer-aided Civil Engineering Drawing Lab	0	0	2	60	40	100	1
BCIES1-305	Surveying Lab	0	0	4	60	40	100	2
BCIES1-306	Training-I*	-	-	-	60	40	100	3
	Total	17	1	8	560	640	1200	25

*Training will be imparted in the institution at the end of 2nd semester for four-week duration.

Semester –IV								
Course Code	**Course Name**	**Schedule of Teaching**			**Evaluation Scheme**			**Credits**
		L	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMECE0-002	Mechanical Engineering	2	1	0	40	60	100	3
BCIES1-401	Instrumentation & Sensor Technologies for Civil Engineering Applications	2	0	0	40	60	100	2
BCIES1-402	Engineering Geology	2	0	0	40	60	100	2
BCIES1-403	Disaster Preparedness & Planning	2	0	0	40	60	100	2
BCIES1-404	Introduction to Fluid Mechanics	2	0	0	40	60	100	2
BCIES1-405	Introduction to Solid Mechanics	3	0	0	40	60	100	3
BCIES1-406	Geomatics Engineering	3	0	0	40	60	100	3
BCIES1-407	Materials, Testing & Evaluation	2	0	0	40	60	100	2
BHSMC0-022	Civil Engineering - Societal & Global Impact	2	0	0	40	60	100	2
BMNCC0-005	Management I (Organizational Behavior)	3	0	0	100	0	100	0
BCIES1-408	Instrumentation & Sensor Technologies for Civil Engineering Applications Lab	0	0	2	60	40	100	1
BCIES1-409	Engineering Geology Lab	0	0	2	60	40	100	1
BCIES1-410	Fluid Mechanics Lab	0	0	2	60	40	100	1
BCIES1-411	Solid Mechanics Lab	0	0	2	60	40	100	1
BCIES1-412	Materials, Testing & Evaluation Lab	0	0	2	60	40	100	1
	Total	23	1	10	760	740	1500	26

*There will be 4-6 weeks internship at the end of fourth semester.

BASIC ELECTRONICS

Subject Code: BECEE0-001 **L T P C** **Contact Hrs. 15**
1 0 0 1

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.* Lab should be taken concurrently. This course emphasizes more on the laboratory/practical use of the knowledge gained from the course lectures.

What Will I Learn?

a) Know broadly the concepts and functionalities of the electronic devices, tools and instruments
b) Understand use, general specifications and deploy abilities of the electronic devices, and assemblies
c) Confidence in handling and usage of electronic devices, tools and instruments in engineering applications

Proposed Syllabus (All modules to provide only broad overview) (No. of lectures shown within brackets)

Unit-I

Module1:*Diodes and Applications* covering, Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications; Silicon Controlled Rectifier (SCR) – Operation, Construction, Characteristics, Ratings, Applications. (4)

Unit-II

Module 2*: Transistor Characteristics* covering, Bipolar Junction Transistor (BJT) –Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, 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. (4)

Unit-III

Module 3*: Transistor Amplifiers and Oscillators* covering, Classification, Small Signal Amplifiers – Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit; Feedback Amplifiers – Principle, Advantages of Negative Feedback, Topologies, Current Series and Voltage Series Feedback Amplifiers; Oscillators – Classification, RC Phase Shift, Wien Bridge, High Frequency LC and Non-Sinusoidal type Oscillators. (4)

Unit-IV

Module 4*: Operational Amplifiers and Applications* covering, Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal OpAmp, Concept of Virtual Ground. (3)

Text/Reference Books:

1. David. A. Bell (2003), *Laboratory Manual for Electronic Devices and Circuits*, Prentice Hall, India
2. Santiram Kal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India
3. Thomas L. Floyd and R. P. Jain (2009), *Digital Fundamentals* by Pearson Education,
4. Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), *Basic Electronics – A Text-Lab.Manual*, TMH
5. R. T. Paynter (2009), *Introductory Electronic Devices & Circuits, Conventional FlowVersion*, Pearson

COMPUTER AIDED CIVIL ENGINEERING DRAWING

Subject Code: BCIESI-301 **L T P C** **Contact Hrs. 15**
1 0 0 1

The students will be able to

a) Develop Parametric design and the conventions of formal engineering drawing
b) Produce and interpret 2D & 3D drawings
c) Communicate a design idea/concept graphically/ visually
d) Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.
e) Get a Detailed study of an engineering artifact

Proposed Syllabus (No. of lectures shown within brackets)

Unit-I

Module 1: *INTRODUCTION*; 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. (2)

Unit-II

Module 2: *SYMBOLS AND SIGN CONVENTIONS*: Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards. (2)

Module 3: *MASONRY BONDS:* English Bond and Flemish Bond – Corner wall and Cross walls - One brick wall and one and half brick wall. (1)

Unit-III

Module 4: *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. Roof drainage plans, Depicting joinery, standard fittings & fixtures, finishes, Use of Notes to improve clarity. (7)

Unit-IV

Module 5: *PICTORIAL VIEW*: Principles of isometrics and perspective drawing, Perspective view of building, Fundamentals of Building Information Modelling (BIM). (3)

Text/Reference Books:

1. Subhash C Sharma & Gurucharan Singh (2005), "Civil Engineering Drawing", Standard Publishers
2. Ajeet Singh (2002), "Working with AUTOCAD 2000 with updates on AUTOCAD 200I", Tata- Mc Graw-Hill Company Limited, New Delhi
3. Sham Tickoo Swapna D (2009), "AUTOCAD for Engineers and Designers", Pearson Education,
4. Venugopal (2007), "Engineering Drawing and Graphics + AUTOCAD", New Age International Pvt. Ltd.,
5. Balagopal and Prabhu (1987), "Building Drawing and Detailing", Spades publishing KDR building, Calicut,
6. (Corresponding set of) CAD Software Theory and User Manuals.
7. Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd New Asian.
8. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria& Sons,

Goals & Outcomes:

The course should enable the students to

i) To develop graphical skills for communicating concepts, ideas and designs of engineering products graphically/ visually as well as understand another person's designs,
ii) and to get exposure to national standards relating to technical drawings using Computer Aided Design and Drafting practice
iii) Develop Parametric design and the conventions of formal engineering drawing
iv) Produce and interpret 2D & 3D drawings
v) Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.
vi) Do a detailed study of an engineering artefact
vii) Develop drawings for conventional structures using practical norms.

ENGINEERING MECHANICS

Subject Code: BMECE0-001 **L T P C** **Contact Hrs. 60**
3 1 0 4

The objective of 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. Lab should be taken concurrently

What Will I Learn?

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

Proposed Syllabus (No. of lectures shown within brackets)

Unit-I

Module 1*: Introduction to Engineering Mechanics covering,* Force Systems, Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy. (7)

Module 2*:Friction covering,* Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack. (6)

Unit-II

Module 3*:Basic Structural Analysis covering,* Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines. (8)

Module 4*:Centroid and Centre of Gravity covering,* Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia-Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook. (8)

Unit-III

Module 5*:Virtual Work and Energy Method*-Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency, Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium, Applications of energy method for equilibrium, Stability of equilibrium. (7)

Module 6:*Review of particle dynamics*-Rectilinear motion; Plane curvilinear motion(rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates), Work-kinetic energy, power, potential energy, Impulse-momentum (linear, angular); Impact (Direct and oblique). (7)

Unit-IV

Module 7:*Introduction to Kinetics of Rigid Bodies covering*, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation. (8)

Module 8:*Mechanical Vibrations covering*, Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums. (9)

Tutorials *from the above modules covering*, To find the various forces and angles including resultants in various parts of wall crane, roof truss, pipes, etc.; To verify the line of polygon on various forces; To find coefficient of friction between various materials on inclined plan; Free body diagrams various systems including block-pulley; To verify the principle of moment in the disc apparatus; Helical block; To draw a load efficiency curve for a screw jack

Text/Reference Books:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
7. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
8. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
10. Tayal A.K. (2010), Engineering Mechanics, Umesh Publication.

Upon successful completion of the course, student should be able to:

- Use scalar and vector analytical techniques for analysing forces in statically determinate structures
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems
- Apply basic knowledge of maths and physics to solve real-world problems
- Understand measurement error, and propagation of error in processed data
- Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts);

- Understand basic dynamics concepts – force, momentum, work and energy;
- Understand and be able to apply Newton's laws of motion;
- Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution;
- Extend all of concepts of linear kinetics to systems in general plane motion (applying Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces)
- Learn to solve dynamics problems. Appraise given information and determine which concepts apply, and choose an appropriate solution strategy; and
- Attain an introduction to basic machine parts such as pulleys and mass-spring systems.

ENERGY SCIENCE & ENGINEERING

Subject Code: BCIESI-302 **L T P C** **Contact Hrs. 30**
2 0 0 2

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.

Proposed Syllabus (No. of lectures shown within brackets)

Unit-I

Module 1*: Introduction to Energy Science:* Scientific principles and historical interpretation to *place energy* use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment. (3)

Module 2: *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). (4)

Unit-II

Module 3:*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. (5)

Unit-III

Module 4: *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. (10)

Unit-IV

Module 5: *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. (8)

Text/Reference 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
4. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
5. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
6. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
7. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company
8. Related papers published in international journals.

SURVEYING

Subject Code: BCIESI-303 **L T P C** **Contact Hrs. 30**
2 0 0 2

Proposed Syllabus (No. of lectures shown within brackets)

Unit - I

Definition, principles of surveying, different types of surveys, topographical map, scale of map, Measurement of distances with chain and tape, direct & indirect ranging, offsets.
Instruments used in traversing, bearings, meridians, declination, dip of magnetic needle, bearing of lines from included angles, local attraction, closing error and its removal. (10)

Unit-II

Principle of plane table survey, setting up the plane table and methods of plane tabling, Setting up a dumpy level, booking and reducing the levels by rise & fall method and height of instrument method, correction due to curvature and refraction, characteristics of contours, methods of contouring, uses of contour maps. (7)

Unit – III

Temporary and permanent adjustments of theodolite, measurement of horizontal and vertical angles, closed & open traverse, consecutive and independent co-ordinates, advantages and disadvantages of traversing, Latitudes and Departures, closing error, Bowditch & Transit Rules.
Determination of tachometer constants, Measurement of horizontal & vertical distances with tachometer. (8)

Unit – IV

Selection of stations and base line for geodetic survey, corrections for base line, Elements of curves, different methods of setting out of curves, transition curve. (5)

Recommended Books:

1. B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, 'Surveying', Vol. I, II, Laxmi Publications,
2. S.K. Duggal, Tata McGraw Hill. Vol-I
3. R. Agor, 'Surveying', Khanna Publishers.
4. S.S. Bhavikatti, 'Surveying & Levelling Vol. I, II.
5. Narinder Singh, 'Surveying', Tata McGraw Hill.
6. N.N. Basak, 'Surveying and leveling', Tata McGraw Hill, New Delhi.

MATHEMATICS-III (Transform & Discrete Mathematics)

Subject Code: BMATH4-301 **L T P C** **Contact Hrs. 30**
2 0 0 2

Proposed Syllabus (No. of lectures shown within brackets)

Transform Calculus

Unit-I

Module 8a: *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. (6)

Module 8b:*Transform Calculus*-2
Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their applications. (4)

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
4. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.

Discrete Mathematics

Unit-II

Module 9a:*Sets, relations and functions*:

Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses. (4)

Module 9b:*Propositional Logic:*

Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, Decision problems of propositional logic, Introduction to first order logic and first order theory. (3)

Unit-III

Module 9c:*Partially ordered sets:*

Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices, Boolean and pseudo Boolean lattices. (3)

Module 9d:*Algebraic Structures:*

Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures.

Error correcting code. Algebraic structures with two binary operations-ring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only). (3)

Unit-IV

Module 9e:*Introduction to Counting:*

Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions. (4)

Module 9f:*Introduction to Graphs:*

Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees. (3)

Textbooks/References:

1. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
2. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.
3. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed., Addison-Wesley, 1994.
4. K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.
5. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Ed., Jones and Bartlett, 2010.
6. N. Deo, Graph Theory, Prentice Hall of India, 1974.
7. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 1999.
8. J. P. Tremblay and R. P. Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill, 1997.

HUMANITIES-I (Effective Technical Communication)

Subject Code: BHSMC0-005 **L T P C** **Contact Hrs. 45**
3 0 0 3

Proposed Syllabus (No. of lectures shown within brackets)

Unit-I

Module 1: Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media. (4)

Module 2: Technical Writing, Grammar and Editing- Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style, advanced technical communication, Usability, Hunan factors, Managing technical communication projects, time estimation, Single sourcing, Localization. (8)

Unit-II

Module 3: Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem, Managing Time, Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity. (10)

Unit-III

Module 4: Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report. (14)

Unit-IV

Module 5: Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity. (9)

Text/Reference Books:

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
4. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
6. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
7. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

INTRODUCTION TO CIVIL ENGINEERING

Subject Code: BHSMC0-021 **L T P C** **Contact Hrs. 45**
3 0 0 3

When the students enter the college to pursue a degree in Civil Engineering and as well pursue a career in Civil Engineering after graduation, they need to understand the breadth and depth available in this field for possible engagement. When many alternative disciplines of engineering appear to offer apparently more glamorous avenues for advancement, the Civil Engineering student should realize the solid foundations available in this mother of all engineering disciplines. The students should understand the enormous possibilities available for creative and innovative works in this all pervasive field of engineering.

This course is designed to address the following:

- 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.

What is Civil Engineering/ Infrastructure, History of Civil Engineering, Overview of ancient &modern civil engineering marvels, current national planning for civil engineering/ infrastructure projects, scope of work involved in various branches of Civil Engineering – Architecture & Town planning, Surveying & Geomatics, Structural Engineering, Construction Management, Construction materials, Hydrology and Water Resources Engineering, Hydraulic Engineering, Environmental Engineering &Sustainability, Pavement Engineering and construction, Traffic & Transportation Engineering and Management, Geotechnical Engineering, Ocean Engineering, Building Energy Efficiency, Basics of Contract Management, Professional Ethics, Avenues for entrepreneurial working, Creativity Innovativeness in Civil Engineering,

Proposed Syllabus (No. of lectures shown within brackets)

Unit-I

1. **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. (2)

2. **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. (2)

3. **Overview of National Planning for Construction and Infrastructure Development**; Position of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for infrastructure works. (1)

4. **Fundamentals of Architecture & Town Planning**: Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities. (2)

5. **Fundamentals of Building Materials**: Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes. (3)

Unit-II

6. **Basics of Construction Management & Contracts Management**: Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems. (2)

7. **Environmental Engineering & Sustainability**: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction. (3)

8. **Geotechnical Engineering**: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunnelling. (3)

9. **Hydraulics, Hydrology &Water Resources Engineering**: Fundamentals of fluid flow, basics of water supply systems; Underground Structures, Multi-purpose reservoir projects. (3)

Unit-III

10. **Ocean Engineering**: Basics of Wave and Current Systems, Ports & Harbours and other marine structures. (2)

11. **Power Plant Structures**: Chimneys, Natural & Induced Draught Cooling towers, coal handling systems, ash handling systems; nuclear containment structures; hydro power projects. (2)

12. **Structural Engineering**: Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis. (3)

13. **Surveying & Geomatics**: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR. (2)

14. **Traffic &Transportation Engineering**: Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; PPP in transport sector; Intelligent Transport Systems; Urban Public and Freight Transportation, Road Safety under heterogeneous traffic, Sustainable and resilient pavement materials, Case studies and examples. (3)

Unit-IV

15. **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. (3)

16. **Computational Methods, IT, IoT in Civil Engineering:** Typical software used in Civil Engineering- Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; highway design (MX), Building Information Modelling; Highlighting typical available software systems (SAP, STAAD, ABAQUS, MATLAB,ETAB, NASTRAN,

NISA, MIKE 21, MODFLOW, REVIT, TEKLA, AUTOCAD, GEOSTUDIO, EDUSHAKE, MSP, PRIMAVERA, ArcGIS, VisSIM. (3)

17. **Industrial lectures**: Case studies of large civil engineering projects by industry professionals, covering comprehensive planning to commissioning. (3)
18. **Basics of Professionalism**: Professional Ethics, Entrepreneurial possibilities in Civil Engineering, Possibilities for creative & innovative working, Technical writing Skills enhancement, Quality & HSE Systems in Construction. (3)

Text/Reference Books:

1. Patil, B.S.(1974), Legal Aspects of Building and Engineering Contract
2. The National Building Code, BIS, (2017)
3. RERA Act, (2017)
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5. Chandiramani, Neelima (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6. Avtarsingh (2002), Law of Contract, Eastern Book Co.
7. Dutt (1994), Indian Contract Act, Eastern Law House
8. Anson W.R.(1979), Law of Contract, Oxford University Press
9. Kwatra G.K.(2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
10. Avtarsingh (2005), Law of Arbitration and Conciliation, Eastern Book Co.
11. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
12. P. S. Narayan (2000), Intellectual Property Rights, Gogia Law Agency
13. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
14. Bare text (2005), Right to Information Act
15. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
16. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act
17. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House
18. Vee, Charles & Skitmore, Martin (2003) Professional Ethics in the Construction Industry, Engineering Construction and Architectural management, Vol.10, Iss. 2, pp 117-127, MCB UP Ltd
19. American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study and Application
20. Ethics in Engineering- M.W.Martin& R.Schinzinger, McGraw-Hill
21. Engineering Ethics, National Institute for Engineering Ethics, USA
22. www.ieindia.org
23. Engineering ethics: concepts and cases –C. E. Harris, M.S. Pritchard, M.J.Rabins
24. Resisting Bureaucratic Corruption: Alacrity Housing Chennai (Teaching Case Study) -S. Ramakrishna Velamuri -CEIBS
25. CONSTRUCTION CONTRACTS, http://www.jnormanstark.com/contract.htm
26. Internet and Business Handbook, Chap 4, CONTRACTS LAW, http://www.laderapress.com/laderapress/contractslaw1.html
27. Contract &Agreements , http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm
28. Contracts, http://206.127.69.152/jgretch/crj/211/ch7.ppt

29. Business & Personal Law. Chapter 7. "How Contracts Arise", http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt

30. Types of Contracts, http://cmsu2.cmsu.edu/public/classes/rahm/meiners.con.ppt
31. IV. TYPES OF CONTRACTS AND IMPORTANT PROVISIONS, http://www.worldbank.org/html/opr/consult/guidetxt/types.html
32. Contract Types/Pricing Arrangements Guideline- 1.4.G (11/04/02), http://www.sandia.gov/policy/14g.pdf

Goals & Outcomes:

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 importantinfrastructure, 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.

BASIC ELECTRONICS LAB

Subject Code: BECEE0-002 **L T P C** **Contact Hrs. 30**
0 0 2 1

Module 1: Laboratory Sessions covering, 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.

Module 2: Study and Operation of Digital Multi Meter, Function / Signal Generator, Regulated Power Supply (RPS), Cathode Ray Oscilloscopes; Amplitude, Phase and Frequency of Sinusoidal Signals using Lissajous Patterns on CRO; (CRO).

Module 3: Experimental Verification of PN Junction Diode Characteristics in A) Forward Bias B) Reverse Bias, Zener Diode Characteristics and Zener Diode as Voltage Regulator, Input and Output Characteristics of BJT in Common Emitter (CE) Configuration, Drain and Transfer Characteristics of JFET in Common Source (CS) Configuration.

Module 4: Study of Half Wave and Full Wave Rectification, Regulation with Filters, Gainand Bandwidth of BJT Common Emitter (CE) Amplifier, Gain and Bandwidth of JFET Common Source (CS) Amplifier, Gain and Bandwidth of BJT Current Series and Voltage Series Feedback Amplifiers, Oscillation Frequency of BJT based RC Phase Shift, Hartley and Colpitts Oscillators; Module 5: Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Op-Amp Applications – Differentiator and Integrator, Square Wave and Triangular Wave Generation, Applications of 555 Timer – Astable and Monostable Multivibrators;

Module 5: Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND,XOR and XNOR Integrated Circuits (ICs); Truth Tables and Functionality of Flip-Flops – SR, JK and D Flip-Flop ICs; Serial-In-Serial-Out and Serial-In-Parallel-Out Shift operations using 4-bit/8-bit Shift Register ICs; Functionality of Up-Down / Decade Counter ICs.

Text/Reference Books:

1. David. A. Bell (2003), *Laboratory Manual for Electronic Devices and Circuits*, Prentice Hall, India
2. Santiram Kal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India
3. Thomas L. Floyd and R. P. Jain (2009), *Digital Fundamentals* by Pearson Education,
4. Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), *Basic Electronics – A Text-Lab.Manual*, TMH
5. R. T. Paynter (2009), *Introductory Electronic Devices & Circuits, Conventional FlowVersion*, Pearson

COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB

Subject Code: BCIES1-304 **L T P C** **0 0 2 1** **Contact Hrs. 30**

1. Buildings with load bearing walls including details of doors and windows.
2. Taking standard drawings of a typical two storey building including all MEP, joinery, rebars, finishing and other details and writing out a description of the Facility.
3. RCC framed structures.
4. Reinforcement drawings for typical slabs, beams, columns and spread footings.
5. Industrial buildings - North light roof structures – Trusses.
6. Perspective view of one and two storey buildings.

Text/Reference Books:

1. Subhash C Sharma & Gurucharan Singh (2005), “Civil Engineering Drawing”, Standard Publishers
2. Ajeet Singh (2002), “Working with AUTOCAD 2000 with updates on AUTOCAD 200I”, Tata- Mc Graw-Hill Company Limited, New Delhi
3. Sham Tickoo Swapna D (2009), “AUTOCAD for Engineers and Designers”, Pearson Education,
4. Venugopal (2007), “Engineering Drawing and Graphics + AUTOCAD”, New Age International Pvt. Ltd.,
5. Balagopal and Prabhu (1987), “Building Drawing and Detailing”, Spades publishing KDR building, Calicut,
6. (Corresponding set of) CAD Software Theory and User Manuals.
7. Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd New Asian.

SURVEYING LAB

Subject Code: BCIES1-305 **L T P C** **Contact Hrs. 60**
0 0 4 2

1. Measurement of distance, ranging a line.

2. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.

3. Different methods of levelling, height of instrument, rise & fall methods.

4. Measurement of horizontal and vertical angle by theodolite.

5. Determination of tachometric constants and determination of reduced levels by tachometric observations.

6. Plane table survey, different methods of plotting, two point & three point problem.

7. Determination of height of an inaccessible object.

8. Setting out a transition curve, setting out of circular curves in the field using different methods.

9. Introduction of Total Station.

Recommended Books:

1. B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, 'Surveying', Vol. I, II, Laxmi Publications,
2. S.K. Duggal, Tata McGraw Hill. Vol-I
3. R. Agor, 'Surveying', Khanna Publishers.
4. S.S. Bhavikatti, 'Surveying & Levelling Vol. I, II.
5. Narinder Singh, 'Surveying', Tata McGraw Hill.
6. N.N. Basak, 'Surveying and leveling', Tata McGraw Hill, New Delhi.

MECHANICAL ENGINEERING

Subject Code: BMECE0-002 **L T P C** **Contact Hrs. 45**
2 1 0 3

Proposed Syllabus (No. of lectures shown within brackets)

Unit-I

Module 1: Basic Concepts- Basic concepts - concept of continuum, macroscopic approach, Thermodynamic systems - closed, open and isolated. Property, state, path and process, quasistatic process, work, modes of work, Zeroth law of thermodynamics, concept of temperature and heat, Concept of ideal and real gases. (4)

Module 2: First Law of Thermodynamics- Concepts of Internal Energy, Specific Heat Capacities, Enthalpy. Energy Balance for Closed and Open Systems, Energy Balance for Steady-Flow Systems, Steady-Flow Engineering Devices, Energy Balance for Unsteady-Flow. (5)

Unit-II

Module 3: Second Law of Thermodynamics- Thermal energy reservoirs, heat engines energy conversion, Kelvin's and Clausius statements of second law, the Carnot cycle, the Carnot Theorem, the thermodynamic temperature scale, the Carnot heat engine, efficiency, the Carnot refrigerator and heat pump, COP. Clausius inequality, concept of entropy, principle of increase of entropy – availability, the increase of entropy principle, perpetual-motion machines, reversible and irreversible processes, Entropy change of pure substances, isentropic processes, property diagrams involving entropy, entropy change of liquids and solids, the entropy change of ideal gases, reversible steady-flow work, minimizing the compressor work, isentropic efficiencies of steady-flow devices, and entropy balance. Energy measure of work potential, including work potential of energy, reversible work and irreversibility, second-law efficiency, energy change of a system, energy transfer by heat, work, and mass, the decrease of energy principle and energy destruction, energy balance: closed systems and control volumes energy balance. (13)

Unit-III

Module 4: Properties Of Pure Substance- Properties of pure substances, Thermodynamic properties of pure substances in solid, liquid and vapour phases. Phase rule, P-V, P-T, T-V, T-S, H-S diagrams, PVT surfaces, Thermodynamic properties of steam. Calculations of work done and heat transfer in non- flow and flow processes. (5)

Module 5: Power Cycles- Vapour and combined power cycles, including the Carnot vapor cycle, Rankine cycle: the ideal cycle for vapour power, the ideal reheat and regenerative and the second law analysis of vapour power cycles. Gas power cycles, including basic considerations in the analysis of power cycles, the Carnot cycle and its value in engineering, an overview of reciprocating engines, air standard assumptions, gasoline engine Otto cycle, diesel engine cycle, gas-turbine Brayton cycle, and the second-law analysis of gas power cycles. (7)

Unit-IV

Module 6: Ideal and Real Gases and Thermodynamic Relations- Gas mixtures – properties ideal and real gases, Equation of state, Avogadro's Law, Vander Waal's equation of state, Compressibility factor, compressibility chart. Dalton's law of partial pressure. Exact differentials, T-D relations, Maxwell's relations, Clausius Clapeyron equations, Joule – Thomson coefficient. (5)

Module 7: Psychrometry and psychrometric charts, property calculations of air vapour mixtures. Psychrometric process – Sensible heat exchange processes. Latent heat exchange processes. Adiabatic mixing, evaporative cooling. Use of standard thermodynamic tables, Mollier diagram, Psychometric chart and Refrigerant property tables. Refrigeration cycles, including refrigerators and heat pumps, the ideal reversed Carnot vapour-compression refrigeration cycle, actual vapor-compression refrigeration cycles, heat pump systems, gas refrigeration cycles, and absorption refrigeration systems. (6)

Text/Reference Books:

1. Nag.P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi.
2. Cengel, Thermodynamics – An Engineering Approach *Tata McGraw Hill, New* Delhi.
3. Sonntag, R. E., Borgnakke, C., & Wylen, G. J. V. Fundamentals of thermodynamics: Wiley.
4. Moran, M. J., Shapiro, H. N., Boettner, D. D., & Bailey, M. Fundamentals of
5. Jones, J. B., & Dugan, R. E. Engineering thermodynamics: Prentice Hall.
6. Potter, M. C., & Somerton, C. W. Schaum's Outline of Thermodynamics for Engineers, McGraw-Hill.

Upon successful completion of the course, student will have:

- Ability to apply mathematics, science, and engineering
- Ability to design and conduct experiments, as well as to analyze and interpret data
- Ability to identify, formulate, and solve engineering problems
- Ability to apply modern engineering tools, techniques and resources to solve complex mechanical engineering activities with an understanding of the limitations.
- Ability to comprehend the thermodynamics and their corresponding processes that influence the behaviour and response of structural components
- Ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations) and thermodynamics to model, analyze, design, and realize physical systems, components, or processes

INSTRUMENTATION & SENSOR TECHNOLOGIES FOR CIVIL ENGINEERING APPLICATIONS

Subject Code: BCIES1-401 **L T P C** **Contact Hrs. 30**
2 0 0 2

The objective of this Course is to understand instrumentation, sensor theory and technology, data acquisition, digital signal processing, damage detection algorithm, life time analysis and decision making. This course introduces theoretical and practical principles of design of sensor systems. Topics include: transducer characteristics for acoustic, current, temperature, pressure, electric, magnetic, gravity, salinity, concentration of contaminants, velocity, heat flow, and optical devices; limitations on these devices imposed by building/structure/pavement environments; signal conditioning and recording; noise, sensitivity, and sampling limitations; and standards. Lectures will cover the principles of state-of-the-art systems being used in physical infrastructure/bridges/buildings/pavements, etc. For lab work, the course will allow students to prepare, deploy and analyze observations from standard instruments. Laboratory experiments shall be used on application of concepts introduced in the lectures.

Providing principle knowledge, practical training and measurement best practice for a range of temperature, pressure, electrical, velocity, acceleration and vibration systems

Proposed Syllabus (No. of lectures shown within brackets)

Unit-I

Module 1:*Fundamentals of Measurement, Sensing and Instrumentation covering* definition of measurement and instrumentation, physical variables, common types of sensors; Describe the function of these sensors; Use appropriate terminology to discuss sensor applications; and qualitatively interpret signals from a known sensor type, types of instrumentation, Sensor Specifics, Permanent installations, Temporary installations. (6)

Unit-II

Module 2:*Sensor Installation and Operation covering:* (i) Predict the response of sensors to various inputs; ii) Construct a conceptual instrumentation and monitoring program; iii) Describe the order and methodology for sensor installation; and iv) Differentiate between types of sensors and their modes of operation and measurement and v) Approach to Planning Monitoring Programs, Define target, Sensor selection, Sensor siting, Sensor Installation & Configuration, Advanced topic, Sensor design, Measurement uncertainty. (8)

Unit-III

Module 3:*Data Analysis and Interpretation covering: (*a) Fundamental statistical concepts, b)Data reduction and interpretation, c) Piezometer, Inclinometer, Strain gauge, etc. d) Time domain signal processing, e) Discrete signals, Signals and noise and f) a few examples of statistical information to calculate are: Average value (mean), On average, how much each measurement deviates from the mean (standard deviation), Midpoint between the lowest and highest value of the set (median), Most frequently occurring value (mode), Span of values over which your data set occurs (range). (8)

Unit-IV

Module 4: *Frequency Domain Signal Processing and Analysis covering:* Explain the need for frequency domain analysis and its principles; Draw conclusions about physical processes based on analysis of sensor data; Combine signals in a meaningful way to gain deeper insight into physical phenomena, Basic concepts in frequency domain signal processing and analysis, Fourier Transform, FFT (Fast Fourier Transform), Example problems: Noise reduction with filters, Leakage, Frequency resolution. (8)

Text/Reference Books:

1. Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann
2. David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press
3. S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis
4. Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer

What will I learn?

Understand the principles of operation and characteristics of instrumentation and integrated sensor systems

Understand right use of sensors and instruments for differing applications along with limitations

Recognize and apply measurement best practice and identify ways to improve measurement and evaluation

Troubleshoot and solve problems in instrumentation and measurement systems

To install and encourage a questioning culture

Outcomes:

To analyze the errors during measurements

To specify the requirements in the calibration of sensors and instruments

To describe the noise added during measurements and transmission

To describe the measurement of electrical variables

To describe the requirements during the transmission of measured signals

To construct Instrumentation/Computer Networks

To suggest proper sensor technologies for specific applications

To design and set up measurement systems and do the studies

ENGINEERING GEOLOGY

Subject Code: BCIES1-402 **L T P C** **Contact Hrs. 30**
2 0 0 2

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.

Proposed Syllabus (No. of lectures shown within brackets)

Unit-I

Module 1: Introduction-Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Department dealing with this subject in India and their scope of work- GSI, Granite Dimension Stone Cell, NIRM. Mineralogy-Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to alteration, basic of optical mineralogy, SEM, XRD., Rock forming minerals, mega scopic identification of common primary & secondary minerals. (2)

Module 2: Petrology-Rock forming processes. Specific gravity of rocks. Ternary diagram. Igneous petrology- Volcanic Phenomenon and different materials ejected by volcanoes. Types of volcanic eruption. Concept of Hot spring and Geysers. Characteristics of different types of magma. Division of rock on the basis of depth of formation, and their characteristics. Chemical and Mineralogical Composition. Texture and its types. Various forms of rocks. IUGS Classification of phaneritic and volcanic rock.. Field Classification chart. Structures. Classification of Igneous rocks on the basis of Chemical composition. Detailed study of Acidic Igneous rocks like Granite, Rhyolite or Tuff, Felsite, Pegmatite, Hornfels. Metamorphic Aureole, Kaolinization. Landform as Tors. Engineering aspect to granite. Basic Igneous rocks Like Gabbro, Dolerite, Basalt. Engineering aspect to Basalt. Sedimentary petrology- mode of formation, Mineralogical Composition. Texture and its types, Structures, Gradation of Clastic rocks. Classification of sedimentary rocks and their characteristics. Detailed study of Conglomerate, Breccia, Sandstone, Mudstone and Shale, Limestone Metamorphic petrology- Agents and types of metamorphism, metamorphic grades, Mineralogical composition, structures & textures in metamorphic rocks. Important Distinguishing features of rocks as Rock cleavage, Schistosity, Foliation. Classification. Detailed study of Gneiss, Schist, Slate with engineering consideration. (7)

Unit-II

Module 3: Physical Geology- Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Superficial deposits and its

geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Residual deposits of Clay with flints, Solifluction deposits, mudflows, Coastal deposits. (2)

Module 4: Strength Behavior of Rocks- Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. 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, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures. (5)

Unit-III

Module 5: 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. Case study on black clay. Ground water: Factors controlling water bearing capacity of rock. Pervious & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case Study on Elevation and Subsidence in Himalayan region in India. Seismic Zone in India. (5)

Module 6: Rock masses as construction material: Definition of Rock masses. Main features constituting rock mass. Main features that affects the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Measurement of velocity of sound in rock. Classification of Rock material strength. Core logging .Rock Quality Designation. Rock mass description. (3)

Unit-IV

Module 7: Geology of dam and reservoir site- Required geological consideration for selecting dam and reservoir site, Failure of Reservoir, Favourable & unfavourable 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 &treatment giving to such structures. (2)

Module 8: Rock Mechanics- Sub surface Investigations in rocks and engineering characteristics or rocks masses; Structural geology of rocks. Classification of rocks, Field & laboratory tests on rocks, Stress deformation, Failure theories and shear strength of rocks, bearing capacity of rocks. (4)

Text/Reference Books:

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

What will I learn?

Students will be able to:

Use suitable software to examine geology, soil, geologic hazard, and NEHRP data to characterize a geologic site.

Calculate the bulk properties of rocks and unconsolidated sediments such as density, void ratio, water contents, and unit weights.

Evaluate rock-mass quality and perform a kinematic analysis.

Apply the factor of safety equation to solve planar rock slide and toppling problems. Perform a grain-size analysis, determine plastic and liquid limits, and classify soilsusing the Unified Soil Classification System.

Calculate soil consolidation magnitudes and rates under induced stress conditions. Determine soil strength parameters from in situ tests.

Apply the method of slices and factor of safety equation to solve rotational slide problems.

Outcomes:

Students will understand:

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.

DISASTER PREPAREDNESS & PLANNING

Subject Code: BCIES1-403 **L T P C** **Contact Hrs. 30**
2 0 0 2

The overall aim of this course is to provide broad understanding about the basic concepts of Disaster Management with preparedness as a Civil Engineer. Further, the course introduces the various natural hazards that can pose risk to property, lives, and livestock, etc. and understanding of the social responsibility as an engineer towards preparedness as well as mitigating the damages.

The objectives of the course are i) To Understand basic concepts in Disaster Management ii) To Understand Definitions and Terminologies used in Disaster Management iii) To Understand Types and Categories of Disasters iv). To Understand the Challenges posed by Disasters vi) To understand Impacts of Disasters Key Skills

Proposed Syllabus(No. of lectures shown within brackets)

Unit-I

Module 1: Introduction-Concepts and definitions: disaster, hazard, vulnerability, risks-severity, frequency and details, capacity, impact, prevention, mitigation. (2)

Module 2: Disasters-Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility. (8)

Unit-II

Module 3: Disaster Impacts-Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters. (6)

Unit-III

Module 4: Disaster Risk Reduction (DRR)-Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority. (9)

Unit-IV

Module 5: Disasters, Environment and Development-Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods. (5)

Text/Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
6. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003

INTRODUCTION TO FLUID MECHANICS

Subject Code: BCIES1-404 **L T P C** **Contact Hrs. 30**
2 0 0 2

The objective of this course is to introduce the concepts of fluid mechanics useful in Civil Engineering applications. The course provides a first level exposure to the students to fluid statics, kinematics and dynamics. Measurement of pressure, computations of hydrostatic forces on structural components and the concepts of Buoyancy all find useful applications in many engineering problems. A training to analyse engineering problems involving fluids – such as those dealing with pipe flow, open channel flow, jets, turbines and pumps, dams and spillways, culverts, river and groundwater flow - with a mechanistic perspective is essential for the civil engineering students. The topics included in this course are aimed to prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology in later semesters.

Proposed Syllabus (No. of lectures shown within brackets)

Unit-I

Module 1: Basic Concepts and Definitions – Distinction between a fluid and a solid; 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. (4)

Unit-II

Module 2: Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies. (10)

Unit-III

Module 3: Fluid Kinematics- Classification of fluid flow : steady and unsteady flow; uniformand 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-, two- and three -dimensional continuity equations in Cartesian coordinates. (7)

Unit-IV

Module 4: Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by

fluid flow on pipe bend; Vortex Flow – Free and Forced; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber *Number and Euler Number; Buckingham's* π-Theorem. (9)

Text/Reference Books:

1. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

At the end of the course, the student will be able to:

Understand the broad principles of fluid statics, kinematics and dynamics
Understand definitions of the basic terms used in fluid mechanics
Understand classifications of fluid flow
Be able to apply the continuity, momentum and energy principles
Be able to apply dimensional analysis

INTRODUCTION TO SOLID MECHANICS

Subject Code: BCIES1-405 **L T P C** **Contact Hrs. 45**
3 0 0 3

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.

Proposed Syllabus (No. of lectures shown within brackets)

Unit-I

Module1: *Simple Stresses and Strains*-Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – 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 modulii and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience Gradual, sudden, impact and shock loadings – simple applications. (7)

Module 2: Compound Stresses and Strains- Two dimensional system, stress at a point on aplane, 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. (6)

Unit-II

Module 3: 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. (7)

Module 4: *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,T, Angle and Channel sections – Design of simple beam sections. (5)

Unit-III

Module 5: *Shear Stresses- Derivation of formula* –Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections. (3)

Module 6: 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. (6)

Unit-IV

Module 7: Torsion- Derivation of torsion equation and its assumptions. Applications of theequation 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. (7)

Module 8: Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures. (4)

Text/Reference Books:

1. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.
2. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.
3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004
4. 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
5. Laboratory Manual of Testing Materials - William Kendrick Hall
6. Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf – TMH 2002.
7. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

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;
- Analyse 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.

GEOMATICS ENGINEERING

Subject Code:BCIES1-406 **L T P C** **Contact Hrs. 45**
3 0 0 3

Proposed Syllabus (No. of lectures shown within brackets)

Unit I: Photogrammetry

Introduction, Basic Principles, Photo-Theodolite, Elevation of a Point by Photographic Measurement, Aerial Camera, Vertical Photograph, Tilted Photograph, Scale, Crab and Drift, Flight Planning for Aerial Photography, Ground Control for Photogrammetry, Photomaps and Mosaics, Stereoscopic Vision, Stereoscopic parallax, Stereoscopic Plotting Instruments, Applications. (13)

Unit II: Remote Sensing

Introduction, Basic Principles, Electromagnetic (EM) Energy Spectrum, EM Radiations and the Atmosphere, Interaction of EM radiations with Earth's Surface, Types of remote sensing systems, Remote Sensing Observation Platforms, Satellites and their characteristics – Geostationary and sun-synchronous, Meteorological satellites, Sensors, Types and their characteristics, Across track and Along track scanning, Applications of Remote Sensing. (10)

Unit III: Geographical Information System (GIS)

Definition, GIS Objectives, Hardware and software requirements for GIS, Components of GIS, Coordinate System and Projections in GIS, Data structure and formats, Spatial data models – Raster and Vector, Data inputting in GIS, Data base design - editing and topology creation in GIS, Linkage between spatial and non-spatial data, Spatial data analysis – significance and type, Attribute Query, Spatial Query, Vector based spatial data analysis, Raster based spatial data analysis, Errors in GIS, GIS Applications, Introduction to GIS Software Packages. (12)

Unit IV: Global Positioning System (GPS)

Introduction, Fundamental concepts, GPS system elements and signals, GPS measurements and accuracy of GPS, GPS Satellites, Co-ordinate systems - Geoids, Ellipsoid and Datum, Spheroid, National Reference Systems, Worldwide Reference Ellipsoid, WGS 84, Differential-GPS, Classification of GPS receivers, GPS Applications. (10)

List of Text Books:

1. Arora, K.R., 2007: Surveying Vol-III, Standard Book House.
2. Campbell, J.B.2002: Introduction to Remote Sensing. Taylor Publications.
3. Chang.T.K. 2002: Geographic Information Systems, Tata McGrawHill.
4. Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press.
5. Punmia, B.C., Jain A.K., 2005: Higher Surveying, Luxmi Publications.
6. Duggal S.K Higher surveying vol-III,Tata McGrawHill.

List of Reference Books:

1. Heywood.I, Cornelius S, Crver Steve. 2003: An Introduction to Geographical Information Systems, Pearson Education.
2. 2.Sabbins, F.F., 1985: Remote Sensing Principles and Interpretation. W.H.Freeman and Company.
3. Kaplan, E.D., Understanding GPS : Principles and Application; Artec House.

MATERIALS, TESTING & EVALUATION

Subject Code:BCIES1-407 **L T P C** **Contact Hrs. 30**
2 0 0 2

The objective of this Course is to deal with an experimental determination and evaluation of mechanical characteristics and advanced behaviour of metallic and non-metallic structural materials. The course deals with explanation of deformation and fracture behaviour of structural materials. The main goal of this course is to provide students with all information concerning principle, way of measurement, as well as practical application of mechanical characteristics.

Make measurements of behaviour of various materials used in Civil Engineering. Provide physical observations to complement concepts learnt Introduce experimental procedures and common measurement instruments, equipment, devices. Exposure to a variety of established material testing procedures and techniques Different methods of evaluation and inferences drawn from observations

The course reviews also 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.

What will I learn?

Different materials used in civil engineering applications

Planning an experimental program, selecting the test configuration, selecting the test specimens and collecting raw data

Documenting the experimental program including the test procedures, collected data, method of interpretation and final results

Operating the laboratory equipment including the electronic instrumentation, the test apparatus and the data collection system

Measuring physical properties of common structural and geotechnical construction materials

Interpreting the laboratory data including conversion of the measurements into engineering values and derivation of material properties (strength and stiffness) from the engineering values

Observing various modes of failure in compression, tension, and shear

Observing various types of material behaviour under similar loading conditions

Proposed Syllabus (No. of lectures shown within brackets)

Unit-I

Introduction to Engineering Materials*:* 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. (9)

Unit-II

Graphene, Carbon composites and other engineering materials including properties and uses of these, acoustical material and geo-textiles, rubber and asbestos, laminates and adhesives. (4)

Introduction to Material Testing covering: What is the "Material Engineering"?;Mechanical behaviour and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals, concept of fatigue of materials; Structural integrity assessment procedure and fracture mechanics. (3)

Unit-III

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. (7)

Unit-IV

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. (7)

Text/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)
7. Related papers published in international journals

Measurable Outcomes:

One should be able to:

Calibrate electronic sensors

Operate a data acquisition system

Operate various types of testing machines

Configure a testing machine to measure tension or compression behavior

Compute engineering values (e.g. stress or strain) from laboratory measures

Analyze a stress versus strain curve for modulus, yield strength and other related attributes

Identify modes of failure

Write a technical laboratory report

CIVIL ENGINEERING – SOCIETAL & GLOBAL IMPACT

Subject Code:BHSMC0-022 **L T P C** **Contact Hrs. 30**
2 0 0 2

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.

The course covers:

- Awareness of the importance of Civil Engineering and the impact it has on the Society and at global levels
- Awareness of the impact of Civil Engineering for the various specific fields of human endeavour
- Need to think innovatively to ensure Sustainability.

Proposed Syllabus(No. of lectures shown within brackets)

Unit-I

Module 1: 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. (3)

Module 2: 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. (3)

Unit-II

Module 3: 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. (8)

Unit-III

Module 4: 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, Stationary and non-stationary; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability. (7)

Unit-IV

Module 5: 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. (5)

Module 6: 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. (4)

Text/Reference Books:

1. *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
2. Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
3. NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004.
4. Allen M. (2008) Cleansing the city. Ohio University Press. Athens Ohio.

5. 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
6. http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx
7. 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
8. Barry M. (2003) Corporate social responsibility – unworkable paradox or sustainable paradigm? Proc ICE Engineering Sustainability 156. Sept Issue ES3 paper 13550. p 129-130
9. 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.
10. Bogle D. (2010) UK's engineering Council guidance on sustainability. Proc ICE Engineering Sustainability 163. June Issue ES2 p61-63
11. 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.
12. Brugnach M., Dewulf A., Pahl-Wostl C., Taillieu T. (2008) Toward a relational concept of uncertainty: about knowing too little, knowing too differently and accepting not to know. Ecology and Society 13 (2): 30
12. Butler D., Davies J. (2011). Urban Drainage. Spon. 3rd Ed.
13. Cavill S., Sohail M. (2003) Accountability in the provision of urban services. Proc. ICE. Municipal Engineer 156. Issue ME4 paper 13445, p235-244.
14. Centre for Water Sensitive Cities (2012) Blueprint for a water sensitive city. Monash University.
15. Charles J A. (2009) Robert Rawlinson and the UK public health revolution. Proc ICE Eng History and Heritage. 162 Nov. Issue EH4. p 199-206

What the student will learn? To develop an understanding of:

- 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 judgement and take a leadership role;

MANAGEMENT-I (Organizational Behaviour)

Subject Code: BMNCC0-005 **L T P C** **Contact Hrs. 45**
3 0 0 0

Course Objectives:
1. To identify global environmental problems arising due to various engineering/industrial and technological activities and the science behind these problems
2. To realize the importance of ecosystem and biodiversity for maintaining ecological balance.
3. To identify the major pollutants and abatement devices for environmental management and sustainable development.
4. To estimate the current world population scenario and thus calculating the economic growth, energy requirement and demand.
5. To understand the conceptual process related with the various climatologically associated problems and their plausible solutions.

. **UNIT-I:**
1. The Multidisciplinary Nature of Environmental Studies:
Definition, scope and importance, Need for public awareness.
2. **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 forests 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 over grazing, 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
(g) Role of an individual in conservation of natural resources.
(h) Equitable use of resources for sustainable lifestyles. (10)

UNIT-II:
Environmental Pollution: Definition
(a) Causes, effects and control measures of:
i) Air pollution
ii) Water pollution
iii) Soil pollution
iv) Marine pollution
v) Noise pollution
vi) Thermal pollution
vii) Nuclear pollution (8)

(b) **Solid Waste Management**: Causes, effects and control measures of urban and industrial wastes.
(c) Role of an individual in prevention of pollution.

(d) Pollution Case Studies.
(e) Disaster management: floods, earthquake, cyclone and landslides. (3)

UNIT-III:
Social Issues and the Environment
(a) From unsustainable to sustainable development
(b) Urban problems and related to energy
(c) Water conservation, rain water harvesting, Watershed Management
(d) Resettlement and rehabilitation of people; its problems and concerns, Case studies.
(e) Environmental ethics: Issues and possible solutions
(f) Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies.
(g) Wasteland reclamation
(h) Consumerism and waste products
(i) Environmental Protection Act
(j) Air (Prevention and Control of Pollution) Act
(k) Water (Prevention and control of Pollution) Act
(l) Wildlife Protection Act
(m) Forest Conservation Act
(n) Issues involved in enforcement of environmental legislation (8)

UNIT-IV:
Human Population and the Environment
(a) Population growth, variation among nations
(b) Population explosion – Family Welfare Programmes
(c) Environment and human health
(d) Human Rights
(e) Value Education
(f) HIV/AIDS
(g) Women and Child Welfare
(h) Role of Information Technology in Environment and Human Health
(i) Case Studies (6)

Environment Science: **(10)**

We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around US. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethoses. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students on the above issues through following two types of activities.

(a) Awareness Activities:
i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste.
ii) Slogan making event
iii) Poster making event
iv) Cycle rally
v) Lectures from experts.

(b) Actual Activities:
i) Plantation
ii) Gifting a tree to see its full growth
iii) Cleanliness drive
iv) Drive for segregation of waste
v) To live some big environmentalist for a week or so to understand his work
vi) To work in kitchen garden for mess
vii) To know about the different varieties of plants
viii) Shutting down the fans and ACs of the campus for an hour or so.

INSTRUMENTATION & SENSOR TECHNOLOGIES FOR CIVIL ENGINEERING APPLICATIONS LAB

Subject Code: BCIES1-408 **L T P C** **Contact Hrs. 30**
0 0 2 1

1. Instrumentation of typical civil engineering members/structures/structural elements Use of different sensors, strain gauges, inclinometers, etc.
2. Performance characteristics
3. Errors during the measurement process
4. Calibration of measuring sensors and instruments
5. Measurement, noise and signal processing
6. Analog Signal processing
7. Digital Signal Processing
8. Demonstration & use of sensor technologies.

Text/Reference Books:

1. Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann
2. David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press
3. S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis
4. Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer

ENGINEERING GEOLOGY LAB

Subject Code: BCIES1-409 **L T P C** **Contact Hrs. 30**
0 0 2 1

1. Study of physical properties of minerals.
2. Study of different group of minerals.
3. Study of Crystal and Crystal system.
4. Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase, Cryptocrystalline group: Jasper; Carbonate group: Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
5. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite, Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.
6. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties , Laterite, Limestone and its varieties, Shales and its varieties.
7. Identification of rocks (Metamorphic Petrolody): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
8. Study of topographical features from Geological maps. Identification of symbols in maps.

Text/Reference Books:

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

FLUID MECHANICS LAB

Subject Code:BEIES1-410 **L T P C** **Contact Hrs. 30**
0 0 2 1

1. Measurement of viscosity
2. Study of Pressure Measuring Devices
3. Stability of Floating Body
4. Hydrostatics Force on Flat Surfaces/Curved Surfaces
5. Verification of Bernoulli's Theorem
6. Venturimeter
7. Orifice meter
8. Impacts of jets
9. Flow Visualization -Ideal Flow
10. Length of establishment of flow
11. Velocity distribution in pipes
12. Laminar Flow

Text/Reference Books:

1. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

SOLID MECHANICS LAB

Subject Code: BEIES1-411 **L T P C** **Contact Hrs. 30**
0 0 2 1

1. Tension test
2. Bending tests on simply supported beam and Cantilever beam.
3. Compression test on concrete
4. Impact test
5. Shear test
6. Investigation of Hook's law that is the proportional relation between force and stretching in elastic deformation,
7. Determination of torsion and deflection,
8. Measurement of forces on supports in statically determinate beam,
9. Determination of shear forces in beams,
10. Determination of bending moments in beams,
11. Measurement of deflections in statically determinate beam,
12. Measurement of strain in a bar
13. Bend test steel bar;
14. Yield/tensile strength of steel bar;

Text/Reference Books:

1. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.
2. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.
3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prntice Hall, 2004
4. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solds. 2nd ed. New York, NY: McGraw Hill, 1979
5. Laboratory Manual of Testing Materials - William Kendrick Hall
6. Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf
7. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

MATERIALS, TESTING & EVALUATION LAB

Subject Code: BCIES1-412 **L T P C** **Contact Hrs. 30**
0 0 2 1

1. Gradation of coarse and fine aggregates
2. Different corresponding tests and need/application of these tests in design and quality Control.
3. Tensile Strength of materials & concrete composites
4. Compressive strength test on aggregates
5. Tension I - Elastic Behaviour of metals & materials
6. Tension II - Failure of Common Materials
7. Direct Shear - Frictional Behaviour
8. Concrete I - Early Age Properties
9. Concrete II - Compression and Indirect Tension
10. Compression – Directionality
11. Soil Classification
12. Consolidation and Strength Tests
13. Tension III - Heat Treatment
14. Torsion test
15. Hardness tests (Brinnel's and Rockwell)
16. Tests on closely coiled and open coiled springs
17. Theories of Failure and Corroboration with Experiments
18. Tests on unmodified bitumen and modified binders with polymers
19. Bituminous Mix Design and Tests on bituminous mixes - Marshall method
20. Concrete Mix Design as per BIS

Text/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
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