

**THE GANDHIGRAM RURAL INSTITUTE – (DEEMED TO BE UNIVERSITY)**  
**CENTRE FOR RURAL TECHNOLOGY**  
**4 year Curriculum Structure**  
**Undergraduate Degree in Engineering & Technology**  
**Course: B.Tech Civil Engineering**

**I. INDUCTION PROGRAM (Mandatory- 3 weeks)**

Induction program for students to be offered right at the start of the first year.

- Physical activity
  - Creative Arts
  - Universal Human Values
  - Literary
  - Proficiency Modules
  - Lectures by Eminent People
  - Visits to local Areas
- Familiarization to Dept./Branch & Innovation

**II. SEMESTER WISE STRUCTURE OF CURRICULUM**

(L- Lecture, T- Tutorials, P- Practicals & C- Credits )

**CFA** - Continuous Formative Assessment

**ESE** - End Semester Examination

**HSMC**- Humanities & Social Sciences including Management

**BSC** - Basic Science Courses

**ESC** - Engineering Science Courses

**MC** - Mandatory Course

\*Note: *Passing minimum -50% in CFA and ESE*

SEMESTER I (I Year)										
B.Tech Civil Engineering										
S.NO	Category	Course Code	Course Title	Hours per Week			C	Marks		Total
				L	T	P		CFA	ESE	
1.	HSMC	18ENGU01F1	English	2	0	2	2+1	40+30	60+20	150
2.	BSC	18BCEU01C1	Physics	3	1	2	4+1	40+30	60+20	150
3.	BSC	18MATU01C1	Mathematics I	3	1	0	4	40	60	100
4.	BSC	18CHEU01C1	Chemistry	3	1	2	4+1	40+30	60+20	150
5.	MC	18GTPU0001	Gandhi's Life, Thought and work	2	0	0	0	50	0	50
6.	ESC	18BCEU0102	Engineering Graphics & Design	1	0	4	3	60	40	100
7.	MC	18YOGU0001	Yoga Education	0	0	1	0	50	0	50
<b>Total</b>				<b>14</b>	<b>3</b>	<b>11</b>	<b>20</b>			

SEMESTER II (I Year)										
B.Tech Civil Engineering										
S.NO	Category	Course Code	Course Title	Hours per Week			C	Marks		Total
				L	T	P		CFA	ESE	
1.	BSC	18MATU02C2	Mathematics–II	3	1	0	4	40	60	100
2.	ESC	18BCEU0203	Introduction to Civil Engineering	2	0	0	2	40	60	100
3.	ESC	18BCEU0204	Basic Electrical Engineering	3	1	2	4+1	40+30	60+20	150
4.	ESC	18BCEU0205	Workshop Manufacturing Practices	1	0	4	1+2	60	40	100
5.	ESC	18CSAU02B1	Programming for Problem Solving	3	0	4	3+2	40+60	60+40	200
6.	ESC	18BCEU0206	Computer Aided Civil Engineering Drawing	1	0	2	2	60	40	100
7.	MC	18BCEU0207	Summer Internship-I*	0	0	0	0	100	0	100
8.	MC	18NSSU0001/ 18SPOU0001/ 18FATU0001	NSS/ Sports & Games/ Fine Arts	0	0	1	0	50	0	50
<b>Total</b>				<b>13</b>	<b>2</b>	<b>13</b>	<b>21</b>			

Category	Course code	English	Credits	L	T	P	CFA	ESE	Total
HSMC	18ENGU01F1		2	2	0	0	40	60	100

**Objectives:**

- To enable the students to acquire basic proficiency in English and
- To help them to improve their skills in reading, listening, comprehension, writing and speaking.

**1. Vocabulary Building**

- 1.1 The concept of Word Formation
- 1.2 Root words from foreign languages and their use in English
- 1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
- 1.4 Synonyms, antonyms, and standard abbreviations.

**2. Basic Writing Skills**

- 2.1 Sentence Structures
- 2.2 Use of phrases and clauses in sentences
- 2.3 Importance of proper punctuation
- 2.4 Creating coherence

**3. Identifying Common Errors in Writing**

- 3.1 Subject-verb agreement
- 3.2 Noun-pronoun agreement
- 3.3 Misplaced modifiers
- 3.4 Articles and Prepositions

**4. Nature and Style of sensible Writing**

- 4.1 Describing
- 4.2 Defining and Classifying
- 4.3 Providing examples or evidence
- 4.4 Writing introduction and conclusion

**5. Writing Practices**

- 5.1 Comprehension
- 5.2 Précis Writing
- 5.3 Essay Writing

**Course Outcomes:**

- At the end of the course to make the students proficient in the vocabulary building & sensible writing skills.

Category	Course code	English	credits	L	T	P	CFA	ESE	Total
HSMC	18ENGU01F1		1	0	0	2	30	20	50

**Objectives:**

- To enable the students to acquire basic proficiency in English
- To help them to improve their listening and speaking skills.

**6. Oral Communication**

*(This unit involves interactive practice sessions in Language Lab)*

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

**Suggested Readings:**

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

**Course Outcomes:**

- At the end of the course to make the students proficient in oral communication by pronunciation, listening comprehension, writing and speaking skills.

Category	Course code	Physics (Mechanics & Mechanics of Solids)	credits	L	T	P	CFA	ESE	Total
BSC	18BCEU01C1		4	3	1	0	40	60	100

### Objectives:

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.
- To study about the stresses and strains and their action on beams and trusses.

### Physics: Mechanics

#### Unit 1: Vector mechanics of particles (20)

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates; Potential energy function;  $F = -\text{Grad } V$ ; Conservative and non-conservative forces; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Application: Satellite man oeuvres; No inertial frames of reference; Rotating coordinate system: Five-term acceleration formula — Centripetal and Coriolis accelerations; Applications: Weather systems, Foucault pendulum; Harmonic oscillator; Damped harmonic motion; Forced oscillations and resonance;

#### Unit 2: Planar rigid body mechanics (10)

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples; Introduction to three-dimensional rigid body motion — only need to highlight the distinction from two-dimensional motion in terms of (a) Angular velocity vector, and its rate of change and (b) Moment of inertia tensor; Three-dimensional motion of a rigid body wherein all points move in a coplanar manner: e.g. Rod executing conical motion with center of mass fixed — only need to show that this motion looks two-dimensional but is three-dimensional, and two-dimensional formulation fails.

#### Reference books:

1. Engineering Mechanics, 2nd ed. — MK Harbola
2. Introduction to Mechanics — MK Verma
3. An Introduction to Mechanics — D Kleppner & R Kolenkow
4. Principles of Mechanics — JL Synge & BA Gri\_ths
5. Mechanics — JP Den Hartog
6. Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
7. Mechanical Vibrations — JP Den Hartog
8. Theory of Vibrations with Applications — WT Thomson

## **Mechanics of Solids**

Prerequisites: (i) Physics 1, both Units

(ii) Mathematics course with ordinary differential equations

### **Unit 3: Statics (10)**

Free body diagrams with examples on modeling of typical supports and joints; Condition for equilibrium in three- and two- dimensions; Friction: limiting and non-limiting cases; Force displacement relationship; Geometric compatibility for small deformations; Illustrations through simple problems on axially loaded members like trusses.

### **Unit 4: Mechanics of solids (30)**

Concept of stress at a point; Planet stress: transformation of stresses at a point, principal stresses and Mohr's circle; Displacement field; Concept of strain at a point; Plane strain: transformation of strain at a point, principal strains and Mohr's circle; Strain RoseOe; Discussion of experimental results on one- dimensional material behaviour; Concepts of elasticity, plasticity, strain hardening, failure (fracture / yielding); Idealization of one dimensional stress-strain curve; Generalized Hooke's law with and without thermal strains for isotropic materials; Complete equations of elasticity; Force analysis — axial force, shearforce, bending moment and twisting moment diagrams of slender members (without usingsingularity functions);

**Unit 5:** Torsion of circular shafts and thin-walled tubes (plastic analysis and rectangular shafts not to be discussed); Moment curvature relationship for pure bending of beams with symmetric cross-section; Bending stress; Shear stress; Cases of combined stresses; Concept of strain energy; Yield criteria; Deflection due to bending; Integration of the moment-curvature relationship for simple boundary conditions; Method of superposition(without using singularity functions); Strain energy and complementary strain energy for simple structural elements (i.e. those under axial load, shear force, bending moment and torsion); Castigliano's theorems for deflection analysis and indeterminate problems.

### **Reference books:**

1. An Introduction to the Mechanics of Solids, 2nd ed. with SI Units — SH Crandall, NCDahl & TJ Lardner
2. Engineering Mechanics: Statics, 7th ed. — JL Meriam Engineering Mechanics of Solids — EP Popov.

### **Out comes:**

On successful completion of this course, the student will be able to

- illustrate the vectorial and scalar representation of forces and moments
- analyse the rigid body in equilibrium
- evaluate the properties of surfaces and solids
- calculate dynamic forces exerted in rigid body
- determine the friction and the effects by the laws of friction

Category	Course code	Laboratory : Physics	credit	L	T	P	CFA	ESE	Total
BSC	18BCEU01C1		credit	1	0	0	2	30	20

### Objectives:

- To learn the fundamental concepts of Stress, Strain and deformation of solids.
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
- To understand the effect of torsion on shafts and springs.
- To analyze plane and space trusses

### Physics: Mechanics of Solids

#### List of Exercise

1. Young's modulus of the materials of the beam by cantilever depression.
2. Thickness of any thin plates using single optical lever.
3. Determinates of acceleration due to gravity & radius of gyration using compound pendulum.
4. Spring constant
5. Test involving axial compression to obtain the stress – strain curve
6. Test involving axial tension to obtain the stress – strain curve and the strength
7. Test involving torsion to obtain the torque vs. angle of twist and hence the stiffness
8. Test involving flexure to obtain the load deflection curve and hence the stiffness
9. Tests on springs
10. Hardness tests (Brinell, Rokwell and Vicker)
11. Shear test (Single and Double)
12. Impact test (Charpy and Izod)
13. Verification of Maxwell's law of reciprocal theorem

### Out Comes:

Students will be able to

- Understand the concepts of stress and strain, principal stresses and principal planes.
- Determine Shear force and bending moment in beams and understand concept of theory of simple bending.

- Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.
- Apply basic equation of torsion in design of circular shafts and helical springs, .
- Analyze the pin jointed plane and space trusses



Category	Course code	Mathematics-I (Calculus, Multivariable calculus & Linear algebra	credits	L	T	P	CFA	ESE	Total
BSC	18MATU01C1		4	3	1	0	40	60	100

**Objectives:**

- To apply advanced matrix knowledge to Engineering problems.
- To equip themselves familiar with the functions of several variables.
- To familiarize with the applications of differential equations.
- To improve their ability in solving geometrical applications of differential calculus problems
- To expose to the concept of three dimensional analytical geometry.

**Unit 1: Calculus:** Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

**Unit 2: Sequences and series:** Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half rangesine and cosine series, Parseval's theorem.

**Unit 3: Multivariable Calculus (Differentiation) :**Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence; Multivariable Calculus (Integration); Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration).

**Unit 4:Matrices (in case vector spaces is not to be taught):**Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigen values and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

**Unit 5: Vector spaces:** Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps, Matrix associated with a linear map.

### **Textbooks**

1. T. Veerarajan, Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
2. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11<sup>th</sup> Reprint, 2010.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35<sup>th</sup> Edition, 2000

### **References:**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
  2. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
  3. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.
- Erwin Kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.

### **Outcomes:**

After completing this course, students should demonstrate competency in the following skills:

- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- Apply various techniques in solving differential equations.

Category	Course code	Chemistry	credit	L	T	P	CFA	ESE	Total
BSC	18CHEU01C1		4	3	1	0	40	60	100

### Objectives:

The objective of the course is

- To emphasize the importance of water and its treatment methods for industrial applications,
- To give an overview of various types of fuels including their refining methods,
- To stress the importance of corrosion of metals and methods needed to protect the metallic materials,
- To make the students understand the need of high polymers and other engineering materials.

#### Unit 1 Atomic and molecular structure (12 lectures)

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

#### Unit 2 Spectroscopic techniques and applications (12 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

#### Intermolecular forces and potential energy surfaces

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of  $H_3$ ,  $H_2F$  and  $HCN$  and trajectories on these surfaces.

#### Unit 3 Use of free energy in chemical equilibria (6 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

#### Unit 4: Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes,

ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

### **Unit 5: Stereochemistry (8 lectures)**

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

#### **Organic reactions and synthesis of a drug molecule**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

#### **Suggested Text Books**

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Vollhardt and N. E. Schore, 5<sup>th</sup> Edition <http://bcs.whfreeman.com/vollhardtschore5e/default.asp>

#### **Course Outcomes**

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

Category	Course code	Chemistry Laboratory	credit	L	T	P	CFA	ESE	Total
BSC	18CHEU01C1		credit	1	0	0	2	30	20

### Objectives:

The objective of the practical course is to enhance knowledge in basic principles of titrimetry, to develop skill in titrimetric analysis, to gain practical knowledge in oil analysis and to develop skill in identification of water quality parameters.

### Choice of 1-10 experiments from the following:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

## **Laboratory Outcomes**

- The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
- Synthesize a small drug molecule and analyse a salt sample

Category	Course code	Gandhi's Life, Thought and work	Credit	L	T	P	CFA	ESE	Total
MC	18GTPU0001		0	2	0	0	50	0	50

## Objectives

1. To enable students to understand and appreciate the principles and practices of Gandhi and their relevance in the contemporary times.
2. To develop character and attitude to follow Gandhian values and responsibilities in their personal and social life.

**Unit 1:** Life of Gandhi in brief: Early life in India – London Phase – South African Adventure-Struggle for total freedom in India – Martyrdom

**Unit 2:** Concepts of Gandhi's Philosophy, Truth and Nonviolence, Ends and Means, Right and Duties, Simply Living and High Thinking

**Unit 3:** Gandhi's concepts and their applications: Sarvodaya, Satyagraha, Santhi Sena Constructive Work

**Unit 4:** Gandhian Vision of Society: Self and society-Communal harmony, removal of untouchability and Equality of sexes – Policies: Decentralization of power, Gram Swaraj (Panchayatui Raj) and good governance-Economics of Swadeshi, Trusteeship, Bread Labour and Self-employment.

**Unit 5:** Gandhian Dimension of Education: Basic Education, Adult Education, Pluralism-Multilingualism, Religions and interfaith relations-Health; Diet, Nature Cure, Education on Health, Sanitation and Hygiene.

## REFERENCES:

1. M.K. Gandhi: (1983), An Autography of the Story of My Experiments with Truth, Navajivan Publishing House, Ahmedabad.
2. M.K. Gandhi: (1951), Satyagraha in South Africa: Navajivan Publishing House, Ahamadabad.
3. M.K. Gandhi: (1983), Construtive Programme” Its Meaning and Place. Navajivan Publishing House, Ahamadabad.
4. M.K. Gandhi: (1948) Key to Health, Navajivan Publishing House, Ahamadabad.
5. M.K. Gandhi: (1949), Diet and Diet Reforms, Navajivan Publishing House, Ahamadabad.
6. M.K. Gandhi: Basic Education, Navajivan Publishing House, Ahamadabad.
7. M.K. Gandhi: (2004), Village Industries, Navajivan Publishing House, Ahamadabad.
8. M.K. Gandhi: (1962), Hindi Swaraj, Navajivan Publishing House, Ahamadabad.
9. M.K. Gandhi: (2004), Trusteeship Dreams, Navajivan Publishing House, Ahamadabad.
10. M.K. Gandhi: (2001), India of my Dreams, Navajivan Publishing House, Ahamadabad.
11. M.K. Gandhi: Self Restraint Vs. Self Indulgence, Navajivan Publishing House, Ahamadabad.
12. Arunachalam:Gandhi: (1985), The Peace Maker, Gandhi Samarak Nidhi, Madurai R.R. Prabhu & UR Rao. The Mind of Mahatma Gandhi, Navajivan Publishing House.

## Outcomes:

At the end of this course to make the students:

- To understand the life of Gandhiji in-depth.
- To get introduced to the relevant Gandhian philosophies.
- To apply the Gandhian concepts in the relevant context.
- To envision the Gandhian socio-economic, political and cultural ideas.
- To get educated on Gandhian lines in a multi-dimensional way.



Category	Course code	Engineering Graphics & Design	C	L	T	P	CFA	ESE	Total
ESC	18BCEU0102		3	1	0	4	60	40	100

### Objectives:

To make student conversant

- With the construction of geometrical figures
- With the projection of 1D, 2D and 3D elements
- With the sectioning of solids and development of surfaces
- With the Preparation and interpretation of building drawing

### Specific Objectives of Learning:

- On completion of the course, the students will be able to understand the drawing, projection of lines, points and solids, understand the intersection of solids and able to draw the any type of technical drawing with detailed specification in scaling system.

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:

- To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- To prepare you to communicate effectively
- To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

### Proposed Syllabus

**Traditional Engineering Graphics:** Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

**Computer Graphics:** Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling;

Introduction to Building Information Modelling (BIM) TOTAL OF 10 LECTURE HOURS & 60 HOURS OF LAB (Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory)

**Unit 1:** Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

**Unit 2:** Orthographic Projections covering, Principles of Orthographic Projections- Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

**Unit 3:** Projections of Regular Solids covering, those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

**Unit 4:** Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

**Unit 5:** Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

**Unit 6:** Overview of Computer Graphics covering, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

**Unit 7:** Customisation & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually

and automatically; Producing drawings by using various coordinate inputentry methods to draw straight lines, Applying various ways of drawing circles;

**Unit 8:** Annotations, layering & other functions covering applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

**Unit 9:** Demonstration of a simple team design project that illustrates Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

**Text/Reference Books:**

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals

**Outcomes:**

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modelling
- Exposure to computer-aided geometric design
- Exposure to creating working drawings
- Exposure to engineering communication

Category	Course code	Yoga Education	C	L	T	P	CFA	ESE	Total
MC	18YOGU0001			0	0	0	1	50	0

**Objective:**

To gain knowledge about the Yogic Practices

**UNIT - I**

**History of Yoga** - Definition of the term Yoga - Comprehensive Nature and Scope of Yoga-Aims and Objectives of Yoga - Yoga as an ideal system of physical culture.

**Text books:**

1. H R.Nagarathnam & Dr.H R Nagendra (2015) Promotion of positive health swami vivekanandha yoga prakashana, Banglore.

**UNIT – II**

**Schools of Yoga:** Patanjaliyoga – Astangayoga – Tantrayoga – Mantrayoga – Hathayoga – Layayoga - Rajayoga – Jnanayoga – Bhaktiyoga – Karmayoga - Difference between practice of Asanas and Physical Exercise.

**Text books:**

1. Light on Yoga, B.K.S Iyengar Harpine Collins Publication, New Delhi, 2000.
2. Sound Health Through Yoga, K.Chandrasekaran, Prem Kalyan Publications, Sedapatti, 1999.

**UNIT – III**

**Asanas Practice:** Meditative Asanas: Sukhasana – Ardha Padmasana – Padmasana – Vajrasana – Standing Asanas: Tadasana –Trikonasana- Parivrtta Trikonasana – Vrikshasana –Sitting Asanas: Baddha konasana – Janusirasana – Paschimottanasana – Ustrasana – Vakrasana - Gomukhasana - Suryanamaskar.

**Text books:**

1. H R.Nagarathnam & Dr.H R Nagendra (2015) Promotion of positive health swami vivekanandha yoga prakashana, Banglore.
2. Swami Satyananda Saraswati, (2008): Asana Pranayama Mudra, Bandha (IV Revised Edition): Bihar School of Yoga, Munger, India.

**UNIT: IV**

**Asanas Practice:** Prone Asanas: Makarasana – Bhujangasana – Shalabhasana – Dhanurasana - Supine Asanas: Pavanamuktasana – Sethubandasana – Navasana – Savasana.

**Text books:**

1. H R.Nagarathnam & Dr.H R Nagendra (2015) Promotion of positive health swami vivekanandha yoga prakashana, Banglore.

**UNIT- V**

**Pranayama Practice:** Sectional Breathing - Nadisuddhi – Bhramari – Bhastrika - Kapalabhati – Introduction to Bandhas – Mudras – Dharana (Trataka) – Dhyana.

**Text books:**

1. Swami Satyananda Saraswati, (2008): Asana Pranayama Mudra, Bandha (IV Revised Edition): Bihar School of Yoga, Munger, India.

**Reference books:**

1. Asanas, Swami Kuvalayananda, Kaivalayadhama, Lonavla, 1993.
2. Yoga for All, Maharishi Patanjali, Sahni Publications, 2003.
3. Yoga for Health, Institute of Naturopathy & Yogic Sciences, Bangalore, 2003.
4. Yoga for Health, K.Chandara Shekar, Khel Sahitya Kendra, Theni, 2003.
5. Yoga for the Morden Man, M.P.Pandit, Sterling Publishers Private Limited, New Delhi, 1987.
6. Yoga for You, Indira Devi, Jaico Publishing House, Chennai, 2002.

**Web Resources**

1. <https://kdham.com/>
2. <http://www.biharyoga.net/>

**Course Outcomes:**

Students should be able to

- Evaluate the importance of preparatory exercise.
- Demonstrate the suryanamaskar and various asanas.
- Utilize the meditation techniques.
- Compare mudras and bandhas
- Assess the difference between the asanas and physical exercises.

Category	Course code	Mathematics–II (Differential Equations)	C	L	T	P	CFA	ESE	Total
BSC	18MATU02C2		4	3	1	0	40	60	100

### Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in multivariable integration. Ordinary and partial differential equations and complex variables. It helps to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

**Unit 1:** Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for  $p$ , equations solvable for  $y$ , equations solvable for  $x$  and Clairaut's type. Ordinary differential equations of higher orders; Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Besselfunctions of the first kind and their properties.

**Unit 2:** Partial Differential Equations – First order, First order partial differential equations, solutions of first order linear and non-linear PDEs.

**Unit 3:** Partial Differential Equations – Higher order, Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation.

**Unit 4:** Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables. Boundary-value problems: Solution of boundary-value problems for various linear PDEs in various geometries.

**Unit 5:** Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their

properties. Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

### **Textbooks**

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9<sup>th</sup> Edition, Wiley India, 2009.
2. S. L. Ross, Differential Equations, 3<sup>rd</sup> Ed., Wiley India, 1984.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
4. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993.
5. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1964.
6. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

### **References:**

1. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4<sup>th</sup> Ed., Prentice Hall, 1998.
2. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010.

### **Outcomes:**

- The mathematical tools needed in evaluating multiple integrals and their usage.
- The effective mathematical tools for the solutions of differential equations that model physical processes.
- The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.



Category	Course code	Introduction to Civil	C	L	T	P	CFA	ESE	Total
ESC	18BCEU0203	Engineering	2	2	0	0	40	60	100

### Objectives:

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.

### Proposed Syllabus

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,

## Units

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. **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
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;
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
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
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; Advent of Lean Construction; Importance of Contracts Management
7. **Environmental Engineering & Sustainability: Water treatment systems;** Effluent treatment systems; Solid waste management; Sustainability in Construction;
8. **Geotechnical Engineering:** Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunnelling
9. **Hydraulics, Hydrology & Water Resources Engineering:** Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multipurpose reservoir projects

10. **Ocean Engineering:** Basics of Wave and Current Systems; Sediment transport systems; Ports & Harbours and other marine structures
11. **Power Plant Structures:** Chimneys, Natural & Induced Draught Colling towers, coal handling systems, ash handling systems; nuclear containment structures; hydro power projects
12. **Structural Engineering:** Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies;
13. **Surveying & Geomatics:** Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR;
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, design, construction and management; Case studies and examples.
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.
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, ...)
17. **Industrial lectures:** Case studies of large civil engineering projects by industry professionals, covering comprehensive planning to commissioning;
18. **Basics of Professionalism:** Professional Ethics, Entrepreneurial possibilities in Civil Engineering, Possibilities for creative & innovative working, Technical writing

Skills enhancement; Facilities Management; Quality & HSE Systems in Construction

**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. Wadhwa (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>

**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 important infrastructure, and impressive projects to serve as sources of inspiration
- Highlighting possibilities for taking up entrepreneurial activities in this field
- Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering

Category	Course code	Basic Electrical Engineering	C	L	T	P	CFA	ESE	Total
ESC	18BCEU0204			4	3	1	0	40	60

**Objectives:**

- To provide comprehensive idea about AC and D C circuit analysis, working principles and applications of basic machines in electrical engineering.

**UNIT 1: DC Circuits (8 hours)**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

**UNIT 2: AC Circuits (8 hours)**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three- phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT 3: Transformers (6 hours)**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

**UNIT 4: Electrical Machines (8 hours)**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor Construction, working, torque-speed characteristic and speed control of separately excited dc motor Construction and working of synchronous generators.

**UNIT 5: Power Converters & Electrical Installation (6 hours)**

DC-DC buck and boost converters, duty ratio control Single-phase and three-phase voltage source inverters; sinusoidal modulation. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries,

Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

### **Suggested Text / Reference Books**

- (i) D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
- (ii) D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
- (iii) L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
- (iv) E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
- (v) V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

### **Course Outcomes**

- To understand the basic concepts of magnetic circuits, electro magnetism and electrostatics.
- To understand and analyses AC & DC circuits.
- To understand the working principle, and applications of DC & AC machines.

Category	Course code	Basic Electrical Engineering Laboratory	C	L	T	P	CFA	ESE	Total
ESC	18BCEU0204		1	0	0	2	30	20	50

### Objectives:

- To provide comprehensive idea about use of basic safety precautions in this field, transformers, working principles and applications of basic machines in electrical engineering.

### (ii)Basic Electrical Engineering Laboratory [ L : 0; T:0 ; P : 2 (1 credit)]

#### List of experiments/demonstrations:

- Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
- Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
- Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
- Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
- Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
- Torque Speed Characteristic of separately excited dc motor.



- Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super-synchronous speed.
- Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
- Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

**Laboratory Outcomes:**

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.
5. Get an exposure to the working of power electronic converters.

Category	Course code	Workshop Manufacturing	C	L	T	P	CFA	ESE	Total
ESC	18BCEU0205	Practices	3	1	0	4	60	40	100

### Objectives:

Manufacturing is fundamental to the development of any engineering product. This course is intended to expose engineering students to different types of manufacturing/fabrication processes, dealing with different materials such as metals, ceramics, plastics, wood, glass etc. While the actual practice of fabrication techniques is given more weightage, some lectures and video clips available on different methods of manufacturing are also included. The course intends to prepare students for:

- Understanding different manufacturing techniques and their relative advantages/disadvantages with respect to different applications
- The selection of a suitable technique for meeting a specific fabrication need
- Acquire a minimum practical skill with respect to the different manufacturing methods and develop the confidence to design & fabricate small components for their project work and also to participate in various national and international technical competitions.

### The chief goals of the course are:

1. Introduction to different manufacturing methods in different fields of engineering
2. Practical exposure to different fabrication techniques
3. Creation of simple components using different materials
4. Exposure to some of the advanced and latest manufacturing techniques being employed in the industry

### Lectures & videos: (10 hours)

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods (3 lectures)
2. CNC machining, Additive manufacturing (1 lecture)
3. Fitting operations & power tools (1 lecture)

4. Electrical & Electronics (1 lecture)
5. Carpentry (1 lecture)
6. Plastic moulding, glass cutting (1 lecture)
7. Metal casting (1 lecture)
8. Welding (arc welding & gas welding), brazing (1 lecture)

[More hours can be given to Welding for Civil Engineering students as they may have to deal with Steel structures fabrication and erection; 3D Printing is an evolving manufacturing technology and merits some lectures and hands-on training.

**Suggested Text/Reference Books:**

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu, “Manufacturing Technology – I” Pearson Education, 2008.
4. Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998.
5. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGrawHill House, 2017.

**Laboratory Outcomes**

1. Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
2. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. By assembling different components, they will be able to produce small devices of their interest.

Category	Course code	Programming for Problem Solving	C	L	T	P	CFA	ESE	Total
BSC	18CSAU02B1		3	3	0	0	40	60	100

### Objective(s):

- To learn the basics of computer programming.
- To make students to learn basic of C programming language.
- To learn the problem solving using C program

### Unit-I: Introduction to Programming;

Introduction - Problem Solving Techniques-Algorithm, Flow Chart - Pseudo code, Programming Paradigms - Programming Languages-Types Generations of Programming Languages - Language Translators

### Unit-II: Structure of C Programs and Control Statements;

C fundamentals: Introduction to C - character set - Keywords and identifiers- constants -Data types -Variables - Operators and expressions – comment - Input and Output functions in C - *Control Statements*: if ....else-switch - while - do...while – for - Break and continue statements - go to statement.

### Unit-III: Arrays and String;

Array: defining an array – Processing an array - Single dimensional array – Two dimensional Arrays - Multidimensional array-Character array - String: Declaring, Initializing, Printing and reading strings - String manipulation functions.

### Unit-IV: Function and Structure;

Functions: defining a function -Accessing a function - Passing arguments to a function – Recursion- Structure: Defining, Declaring, initialization - Structures and Functions ,Array of structures.

### Unit-V: Pointers and File Management;

Pointers: pointer declaration-Chain of Pointer - Passing pointers to a function - File:Defining, Opening and closing of files - Input and output operations - Random Access to files.

## Learning Outcomes

Students should be able to

- Understand the Programming Languages
- Understand the Structure of C program.
- Understand about the control structures in C
- Familiarize the concepts of arrays and Strings
- Develop programs using Functions and Structures.
- Know the concepts of pointers.
- Understand the concepts of File Management.
- Be able to develop basic programs in C.

Category	Course code	Laboratory: Programming for Problem Solving	C	L	T	P	CFA	ESE	Total
BSC	18CSAU02B1		2	0	0	4	60	40	100

### Objective(s):

- To learn the basics of computer programming.
- To make students to learn basic of C programming language.
- To learn the problem solving using C program

### C Program for

1. Simple computational problems using arithmetic expressions
2. Branching: if-then-else, Nested if-else, else-if ladder, switch
3. Loops: Conditional & Unconditional Looping
4. 1D Arrays: searching, sorting and manipulation
5. 2D arrays: Matrix Operations.
6. Character Array
7. Strings: String Manipulation operations
8. Functions-call by value: Simple User-Define functions
9. Problems using arrays and functions: Numerical methods (Root finding, numerical differentiation, numerical integration)
10. Recursive functions
11. Structures: Basics, Structure Array, Structure and Functions
12. Pointers: Pointer Declaration, Pointer to Function
13. File handling: File operations

**Text Book:**

1. Computer Programming, Ashok N Kamthane, ITL Education Solution Limited, New Delhi,2007.
2. Programming in ANSI C, E.Balagurusamy, 5/e, Tata - McGraw Hill publishing, New Delhi, August 2010.

**References:**

1. Programming with C, B.S .Gottfried, Schaums outline Series, MCgraw - Hill Publishing Company, 199

**Laboratory Outcomes**

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self-referential structures.
- To be able to create, read and write to and from simple text files.

Category	Course code	Computer Aided Civil Engineering Drawing	C	L	T	P	CFA	ESE	Total
ESC	18BCEU0206		2	1	0	2	60	40	100

**Objectives:**

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 3Dsoftware.
- e) Get a Detailed study of an engineering artifact

**Proposed Syllabus** (No. of lectures shown within brackets)

**Unit 1** 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, coordinate 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 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)

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

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

Total 15 sessions

It may be advisable to conduct Theory sessions along with Lab demonstrations.

**List of Drawing Experiments:**

- |   |    |
|---|----|
| 1. Buildings with load bearing walls including details of doors and windows.  | 09 |
| 2. Taking standard drawings of a typical two storeyed building including all MEP, joinery, rebars, finishing and other details and writing out a description of the Facility in about 500 -700 words. | 06 |
| 3. RCC framed structures  | 09 |
| 4. Reinforcement drawings for typical slabs, beams, columns and spread footings.  | 09 |
| 5. Industrial buildings - North light roof structures - Trusses   | 06 |
| 6. Perspective view of one and two storey buildings   | 06 |
| Total L: 15 + P: 45=60  |    |

**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 2001”, 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, .K.Kataria& Sons,



**Outcomes:**

At the end of the course, the students should enable

- To develop graphical skills for communicating concepts, ideas and designs of engineering products graphically/ visually as well as understand another person's designs,
- and to get exposure to national standards relating to technical drawings using Computer Aided Design and Drafting practice
- Develop Parametric design and the conventions of formal engineering drawing
- Produce and interpret 2D & 3D drawings
- 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.
- Do a detailed study of an engineering artifact
- (vii) Develop drawings for conventional structures using practical norms.

<b>Category</b>	<b>Course code</b>	<b>Summer Internship-I (Building Design and Drafting)</b>	<b>C</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CFA</b>	<b>ESE</b>	<b>Total</b>
<b>MC</b>	<b>18BCEU0207</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>	<b>0</b>

1. 30 days software internship training in Design & Drafting offices related to Civil Engineering.
2. A detailed report is needed for evaluation (ESE).

<b>Category</b>	<b>Course code</b>		<b>C</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CFA</b>	<b>ESE</b>	<b>Total</b>
<b>MC</b>	<b>18NSSU0001/ 18SHSU0001/ 18SPOU0001</b>	<b>NSS / Sports &amp; Games / Fine Arts.</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>50</b>	<b>0</b>	<b>50</b>

(Programmes offered by the Centres / Department in GRI)