Course Structure and Syllabus

of

FIRST YEAR

BACHELOR OF TECHNOLOGY

(COMMON TO ALL BRANCHES)

(From the Session 2018-19)

INDIRA GANDHI INSTITUTE OF TECHNOLOGY, SARANG
(An Autonomous Institute of Government of Odisha)
Dhenkanal, Odisha- 759146
www.igitsarang.ac.in

INDIRA GANDHI INSTITUTE OF TECHNOLOGY, SARANG

Course Structure for 1st Year B.Tech programme (Common to all Branches)

(Effective from 2018-19 Academic Year)

First Semester				Second Semester			
Theory				**Theory**			
Course Code	**Course Name**	**L-T-P (Periods/ Week)**	**Credits**	**Course Code**	**Course Name**	**L-T-P (Periods/ Week)**	**Credits**
BSMA1101	Mathematics-I	3-1-0	3	BSMA1106	Mathematics-II	3-1-0	3
BSPY1102/ BSCY1103	Physics/ Chemistry	3-0-0	3	ESME2113	Engineering Mechanics	3-1-0	3
ESEE2101/ ESEC2102	Basic Electrical Engineering /Basic Electronics Engineering	2-0-0	2	BSCY1103/ BSPY1102/	Chemistry/ Physics	3-0-0	3
ESCE2103/ ESME2104	Basic Civil Engineering / Basic Mechanical Engineering	2-0-0	2	ESEC2102/ ESEE2101	Basic Electronics Engineering / Basic Electrical Engineering	2-0-0	2
HSHM3101/ ESCS2105	Communicative English/ Programming Language using C	3-0-0	3	ESME2104/ ESCE2103	Basic Mechanical Engineering / Basic Civil Engineering	2-0-0	2
				ESCS2105/ HSHM3101	Programming Language using C/ Communicative English	3-0-0	3
Total (Theory)		**14**	**13**	**Total (Theory)**		**18**	**16**
Practical/ Sessional					**Practical/ Sessional**		
BSPY7104/ BSCY7105	Physics Lab/ Chemistry Lab	0-0-3	2	BSCY7105/ BSPY7104/	Chemistry Lab/ Physics Lab	0-0-3	2
ESEE7106/ ESEC7107	Basic Electrical Engg. Lab/ Basic Electronics Engg. Lab	0-0-3	1	ESEC7107/ ESEE7106	Basic Electronics Engg. Lab/ Basic Electrical Engg. Lab	0-0-3	1
ESCE7108/ ESME7109	Basic Civil Engg. Lab/ Basic Mechanical Engg. Lab	0-0-3	1	ESME7109/ ESCE7108	Basic Mechanical Engg. Lab/ Basic Civil Engg. Lab	0-0-3	1
HSHM7102/ ESCS7110	Communicative English Lab/ Programming Language using C Lab	0-0-3	1	ESCS7110/ HSHM7102	Programming Language using C Lab/ Communicative English Lab	0-0-3	1
ESCE7111/ ESME7112	Engineering Graphics & Design Lab/ Workshop Practice	0-0-3	2	ESME7112/ ESCE7111	Workshop Practice/ Engineering Graphics & Design Lab/	0-0-3	2
MCGN9101	Induction Programme (21 Days)	-	0	MCGN9102	(A)NCC/(B)NSS/(C)Yoga/ (D)Professional Ethics	-	0
Total (Practical/ Sessional)		**15**	**7**	**Total (Practical/ Sessional)**		**15**	**7**
TOTAL		**29**	**20**	**TOTAL**		**33**	**23**
TOTAL SEMESTER CREDITS: 20				TOTAL SEMESTER CREDITS: 23			
TOTAL CUMULATIVE CREDITS: 20				TOTAL CUMULATIVE CREDITS: 43			

INDIRA GANDHI INSTITUTE OF TECHNOLOGY, SARANG

Syllabus for 1st Year B.Tech programme (Common to all Branches)
(Effective from 2018-19 Academic Year)

BSMA1101	Mathematics-I	3-1-0	Credit 3

Module I: Calculus **(4 + 1 Hours)**

Evaluation of definite and improper integrals; Beta and Gamma functions and their properties;

Module II: Calculus **(6 + 2 Hours)**

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module III: Matrices **(6 + 2 Hours)**

Matrices, vector addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination.

Module IV: Vector spaces **(6 + 2 Hours)**

Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity.

Module V: Vector spaces **(4 + 1 Hours)**

Eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases. Diagonalization.

Module VI: Vector calculus **(14 + 5 Hours)**

Limit continuity and partial derivatives, directional derivatives, Gradient, curl and divergence. Multiple Integration: line, 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) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes.

Textbooks:

1. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.Chapter 6.6, 11(11.1, 11.2), 2(2.4-2.9), 4(4.1, 4.2), 13(13.1-13.6), 15(15.1-15.4), 16(16.1-16.7)
2. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Edition, John Wiley & Sons, 2006. Chapter 6.8, 7(7.1-7.5)

References:

1. Thomas G.B. and Finney R.L., Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, **35th** Edition, 2000.

3. Peter V.O'Neil, Advanced Engineering Mathematics, Thomson Publisher, India edition.

BSPY1102	Physics	3-0-0	Credit 3

Module-I **(10 Hours)**

Vector Calculus: Gradient of scalar field, divergence and curl of vector fields, Gauss divergence theorem and Stoke's theorem (Statement and physical significance only).

Force: Forces in Nature; Newton's laws of motion; constrained and unconstrained motion, Free body diagrams, Forces in space, Newton's equations of motion in polar, cylindrical and spherical coordinates; Equilibrium of a particle in space, Constraints, degrees of freedom, D' Alembert's principle (Brief ideas, simple applications of formulae, no derivation).

Potential energy function: Force and motion from potential energy curve, Oscillations about a stable point, Force from the potential energy function, conservative and non-conservative forces; impact, coefficient of restitution.

Oscillation: Simple Harmonic Oscillation, Damped oscillation, Forced oscillation, Resonance, Coupled oscillation.

Waves: Concepts of waves: wave equation, two beam superposition in one dimension, coherent and incoherent superposition.

Module-II **(11 Hours)**

Optics: Interference in thin films, Newton's ring, determination of wavelength of light. Fresnel and Fraunhoffer diffraction, zone plate, Fraunhoffer diffraction through single slit, plane diffraction grating, resolving power of grating. Polarization, polarization by reflection, Brewster's law.

Electromagnetism: Gauss Law of electrostatics, electric displacement, magnetic monopole, magnetic induction, Ampere's circuital law, displacement current, Faradays' law of electromagnetic induction (only statements, no derivation), non conservative electric field and continuity equation for current density.

Maxwell's electromagnetic equations in differential and integral form, Electromagnetic wave equation in vacuum and in conducting media, Poynting vector and its average value, Poynting theorem (statement, no proof).

Module-III **(11 Hours)**

Quantum Mechanics: Needs for Quantum physics- Elementary ideas on blackbody radiation, photoelectric effect, Compton effect, pair production (No derivations). Wave particle duality- Matter waves, de-Broglie hypothesis, Davisson-Germer experiment. Heisenberg's uncertainty principle and its applications: absence of electron in nucleus and ground state energy of Hydrogen atom

Wave function: Wave function and its characteristics, Born interpretation, probability density, normalization, operators, Eigen value, Eigen function, Expectation value, boundary conditions, stationary states, superposition, Schrodinger's equations (Time dependent and time independent).

Applications: Free particle, potential step, finite well, particle in one dimensional potential box, tunneling.

Module- IV **(10 Hours)**

Quantum Statistics: Statistical distribution, Maxwell-Boltzmann, Fermi-Dirac and Bose- Einstein distribution functions, density of states (Only statement and formulae, no derivation), quantum theory of free electrons in metals.

Optoelectronic Devices: LASER, spontaneous and stimulated emission, Principle and working of LASER, Population inversion and pumping, Different types of LASER: Ruby LASER, Helium- Neon LASER, semiconductor LASER, Applications of LASER.

Fibre Optics: Introduction, structure and types of optical fibre, step and graded index fibres, total internal reflection, Acceptance angle, Acceptance cone, Numerical aperture, attenuation, Applications of optical fibre.

BOOKS:

1. Principles of Engineering Physics (Vol-I, II), Md. N. Khan, S. Panigrahi, Cambridge Univ. Press.
2. Engineering Physics, D. R. Joshi, Tata McGraw Hill.
3. Engineering Physics, D.K. Bhattacharya and P. Tandon, Oxford University Press.
4. Concepts of Physics, A. Beiser, McGraw Hill.

BSCY1103	Chemistry	3-0-0	Credit 3

Course Objectives:

The prospective engineers should

1. Memorize the principle of interaction of electromagnetic radiation with matter.
2. Understand the basic concepts of organometallic compounds and different phases of matter.
3. Understand the Basics of fuels and corrosion chemistry.
4. Understand the concept of Nano-technology and apply the same to design engineering materials.

Module I: **(12 Hours)**

Quantum Chemistry and Spectroscopy: Basic concepts and postulates of quantum mechanics. Introduction to Schrödinger Wave Equation. Particle in a box: Energy levels, quantum numbers and selection rule.

Spectroscopy: Lambert Beer's Law, Principles and applications of UV-Visible Molecular Absorption Spectroscopy; Chromophores, applications to colorimetry. Effect of conjugation on chromophores, Absorption by aromatic systems, Introductory idea on Rotational and Vibrational Spectroscopy-Principles and application to diatomic molecules.

Module II: **(12 Hours)**

The phase rule: Statement of Gibb's phase rule and explanation of the terms involved, Phase diagram of one component system – water and sulfur system, Condensed phase rule, Phase diagram of two component system – Eutectic Bi-Cd system.

Organometallics: Introduction to organometallics, EAN rule; classification, nomenclature and characteristics of organometallic compounds. Applications of organometallic compounds and catalyst in alkene isomerization hydrogenation and hydroformylation (detail mechanisms are to be excluded).

Module III: **(10 Hours)**

Fuels: Classification of fuels, calorific value. (Determination by Dulong's formula), G.C.V. and N.C.V. Cracking, Knocking and anti-knocking, cetane and octane numbers. Combustion calculation.

Corrosion: Electrochemical theory of corrosion, galvanic series, Types of corrosion; Differential metal corrosion, Differential aeration corrosion (Pitting and water line corrosion), Stress corrosion (caustic embrittlement in boilers).

Module IV: **(6 Hours)**

Nano Chemistry: Introduction to nano chemistry, nanotechnology applications, material self-assembly, self-assembled monolayers, processes of nanotechnology (top down, bottom up approach), Fullerene, nanocrystals.

Course Outcomes

The prospective engineers should develop the:

1. Ability of optimal use of energy
2. Production and application of nano-materials

Text Books:

1. Engineering Chemistry, Jain and Jain, Dhanpat Rai Publication.
2. Text Book in Applied Chemistry by A. N. Acharya and B. Samantaray, Pearson India.
3. Introductory to Quantum Chemistry by A. K. Chandra. , 4th Edition, McGraw Hill Education.
4. Fundamentals of Molecular & Spectroscopy by Banwell, Tata McGraw Hill Education.
5. Physical Chemistry by Gordon M. Barrow, McGraw-Hill
6. Engineering Chemistry, 12th Edition, Author: Wiley India Editorial Team Publishers Wiley.
7. Engineering Chemistry: Fundamentals and Applications. Shikha Agarwal. Cambridge University Press.

Reference Books:

1. Inorganic Chemistry by Donald A. Tarr, Gary Miessler, Pearson India, Third Edition.
2. Quantum Chemistry by Ira N. Levine, Pearson 7th Edition.
3. Molecular Spectroscopy, Ira N. Levine, John Wiley and Sons
4. Modern Spectroscopy – A Molecular Approach, by Donald McQuarrie and John Simon, published by University Science Books.
5. Inorganic Chemistry by W. Overton, Rounk and Armstrong, Oxford University Press, 6th edition.

ESEC2102	Basic Electronics Engineering	2-0-0	Credit 2

Course Objective:

1. To analyze different types of elementary signals.

2. Understanding the Characteristics of an Ideal Op-Amp.
3. To gain knowledge about semiconductors devices.
4. Provides comprehensive idea about working principle, operation and characteristics of electronic devices.
5. Develop analysis capability in BJT.
6. To develop basic idea on MOSFETs.

MODULE I **(08 Hours)**

Introduction to Signals

Signals, Frequency and Time Domain analysis of signals, Elementary signals (impulse, step and ramp), Analog and digital signals, Discrete signals, Amplifiers, Digital logic inverter.

Operational Amplifiers

The Ideal Op Amp, Different stages of Op-Amp, Virtual Ground Concept Inverting and Non - Inverting configurations, Equivalent Circuit model, Op amp application in Integration, Differentiation and Summing Circuits.

Semiconductor Diodes

Introduction (Intrinsic, Extrinsic semiconductors and their energy level diagrams), P-N junction with open circuit, P-N junction with an applied voltage, Ideal diode, Characteristics of p-n Junction diodes, Rectifier circuits.

Special diodes- Zener diode and Light emitting diode. Display devices- Liquid Crystal Display, Seven Segment Display.

MODULE II **(10 Hours)**

Bipolar Junction Transistors (BJTs)

Simplified structure and physical operation of n-p-n and p-n-p transistors in the active region, Current-voltage characteristics of BJT (Common-Emitter, Common-Base and Common-Collector configurations).BJT as an amplifier and as a switch.

BJT Circuits at DC, Biasing in BJT amplifier circuits, Small Signal Operation of BJT: re-model, Simplified hybrid-π model and its application to single stage BJT amplifiers (Common- Emitter, Common-Base and Common-Collector configurations).A comparison on CB,CE and CC configuration.

Metal Oxide Semiconductor Field - Effect Transistors (MOSFETs)

Structure and Principle of operation of the Enhancement - Type and Depletion - Type MOSFETS. V - I Characteristics, DC - Biasing, Load – line and operating point.

MODULE III **(10 Hours)**

Digital Electronic Principles

Introduction, Binary digits, Logic levels and Digital waveforms, Introduction to basic logic operation, Number system, Decimal numbers, Binary numbers, Decimal-to-Binary conversion, Simple binary arithmetic.

Logic Gates and Boolean Algebra

The inverter, The AND, OR, NAND, NOR, Exclusive-OR and Exclusive-NOR gate, Boolean operations and expressions, Laws and Rules of Boolean algebra, DeMorgan's theorem, Boolean analysis of logic circuits,

Standard forms of Boolean expressions, Boolean expression and truth table.

Text Books:

1. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits", Oxford University Press, 7th Edition, 2014.
2. Thomas L. Floyd and R.P. Jain, "Digital Fundamentals", Pearson Education, 8th Edition, 2009.

Reference Books:

1. Thomas L. Floyd, Pearson Education, "Electronic Devices", Pearson Education, 7th Edition, 2005.
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 11th Edition, 2013.
3. Albert Malvono and David J. Bates, "Electronics Principles", Tata McGraw-Hill Publishing Company Limited, 7th Edition, 2007.

Course Outcomes:

1. Understand the application of diode in rectifiers.
2. Explains the basic knowledge on Op-Amp.
3. Will be able to understand different configuration, V-I Characteristics, applications and different biasing scheme in BJT.
4. Describes Structure and Operation of MOSFETs,
5. Acquire knowledge on Number systems, Logic gates and Boolean algebra.

ESEE2101	Basic Electrical Engineering	2-0-0	Credit 2

Course Outcomes:

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.

Module I: DC Circuits (6 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.

Module II: AC Circuits (6 Hours)

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.

Module III: Electrical Machines (8 Hours)

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer.

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Loss

components and efficiency. Construction, working, torque-speed characteristic and speed control of separately excited dc motor.

Module IV: Electrical Installations (4 Hours)

Components of LT Switch gear: 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.

Text / References:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India,1989

ESME2104	Basic Mechanical Engineering	2-0-0	Credit 2

PURPOSE

To familiarize the students with the basics of Mechanical Engineering.

INSTRUCTIONAL OBJECTIVES

1. To familiarize with the basic machine elements
2. To familiarize with the Sources of Energy and Power Generation
3. To familiarize with the various manufacturing processes

Module I MACHINE ELEMENTS (10 Hours)

Springs: Helical and leaf springs – Springs in series and parallel.

Cams: Types of cams and followers – Cam profile.

Power Transmission: Gears (terminology, spur, helical and bevel gears, gear trains). Belt drives (types). Chain drives. **Simple Problems.**

Module II ENERGY (10 Hours)

Sources: Renewable and non-renewable (various types, characteristics, advantages/disadvantages). **Power Generation:** External and internal combustion engines – Hydro, thermal and nuclear power plants (layouts, element/component description, advantages, disadvantages, applications). **Simple Problems.**

Module III MANUFACTURING PROCESSES (10 Hours)

Sheet Metal Work: Introduction – Equipments – Tools and accessories – Various processes

(Applications, advantages / disadvantages). **Welding:** Types – Equipments – Tools and accessories – Techniques employed -applications, advantages / disadvantages – Gas cutting – Brazing and soldering. **Lathe Practice:** Types - Description of main components – Cutting tools – Work holding devices – Basic operations. **Simple Problems**. **Drilling Practice:** Introduction – Types – Description – Tools. **Simple Problems**.

Reference Books:

1. Kumar, T., Leenus Jesu Martin and Murali, G., Basic Mechanical Engineering, Suma Publications, Chennai, 2007.
2. Prabhu, T. J., Jai Ganesh, V. and Jebaraj, S., Basic Mechanical Engineering, Scitech Publications, Chennai, 2000.
3. Hajra Choudhary, S.K. and Hajra Choudhary, A. K., Elements of Workshop Technology *Vols. I & II*, Indian Book Distributing Company Calcutta, 2007.
4. Nag, P.K., Power Plant Engineering, Tata McGraw-Hill, New Delhi, 2008.
5. Rattan, S.S., Theory of Machines, Tata McGraw-Hill, New Delhi, 2010.

ESCE2103	Basic Civil Engineering	2-0-0	Credit 2

Module-I **(10 Hours)**

Mechanics: Concurrent forces on a plane – Composition and resolution of forces and equilibrium of concurrent coplanar forces, Method of projections, Methods of moment, Friction. Parallel forces in a plane- Two parallel forces, General case of parallel forces, Center of parallel forces in a plane and center of gravity- centroids of composite plane figure and curves, Distributed parallel forces in a plane. General case of forces in a plane- composition of forces in a plane and equilibrium of forces in a plane.

Module-II **(10 Hours)**

Plane trusses- method of joints and method of sections. Moments of Inertia- Plane figure with respect to an axis in its plane and perpendicular to the plane- parallel axis theorem, Moment of Inertia of material bodies.

Rectilinear Translation- Kinematics- Principles of Dynamics- D'Alemberts Principles, Momentum and impulse, Work and Energy- impact.

Module-III **(8 Hours)**

Building Material and Building Construction: Bricks: Brick as a construction material and its importance, qualities of a good brick, Stone: classification, composition and characteristics, Cement: Classification, tests for cement, uses of cement, types of cement, Concrete: Quality of mixing water, Workability, vibration of concrete, concrete mix design, Grade and strength of Concrete. Building Components and their basic requirements, Foundation: Types of foundation, spread foundations, pile foundations, Mortar, Stone masonry, brick masonry, roof, floors, building services: air conditioning, fire protection, ventilation.

Module-IV **(8 Hours)**

Surveying: Linear measurement and chain survey: Use of chains and tapes for measurement of correct length of lines, direct and indirect ranging, Compass surveying: Use of prismatic compass, bearing of a line. Local attraction, Introduction to modern surveying instruments EDM and Total Station.

Transport, Traffic and Urban Engineering: Introduction to planning and design aspects of transportation engineering, different modes of transport, highway engineering, rail engineering, airport engineering, traffic engineering, urban engineering.

Text Books:

1. Engineering Mechanics by S Timoshenko, D.H Young and J.V.Rao, McGraw Hill
2. Basic Civil Engineering, S. Gopi, Pearson
3. Building Construction, Sushil Kumar, Standard Publishers Distributors
4. Surveying and Levelling by R. Subramanian, Oxford University Press

Reference Books:

1. Engineering Mechanics by K.L.Kumar, McGraw Hill
2. Engineering Materials, S.C. Rangwala, Charotar Publishing House
3. Building Material and Construction, G C Sahu, Joygopal Jena, McGraw Hill
4. Surveying Vol-1 by R Agor, Khanna Publishers 5. Basic Civil Engineering, M.S. Palanichamy, McGraw Hill

BSPY7104	Physics Lab	0-0-3	Credit 2

A Student is expected to perform **ten** experiments from the list given below.

1. Determination of Young's modulus by Searle's methods.
2. Determination of Rigidity modulus by static methods.
3. Determination of surface tension by capillary rise method.
4. Determination of acceleration due to gravity by Bar / Kater's pendulum.
5. Determination of thermal conductivity by Lee's method.
6. Determination of wave length of light of light by Newton's ring apparatus.
7. Determination of grating element of a diffraction grating.
8. Determination of wave length of light of light by Biprism.
9. Plotting of characteristic curves of a PN junction diode.
10. Plotting of characteristic curves of BJT.
11. Verification of laws of verification of strings using sonometer.
12. Determination of wavelength of laser source by diffraction rating methods.
13. Study of Hall effect.

14. Study of RC circuit.
15. Study of a power source- output impedance.

BSCY7105	Chemistry Lab	0-0-3	Credit 2

1. Determination of amount of sodium hydroxide and sodium carbonate in a mixture.
2. Standardization of $KMnO_4$ using sodium oxalate.
3. Determination of ferrous iron in Mohr's salt by potassium permanganate.
4. Estimation of calcium in calcium in limestone.
5. Determination of total hardness of water by EDTA method.
6. Determination of percentage of available chlorine in a sample of bleaching powder.
7. Determination of dissolved oxygen in a sample of water.
8. Determination of partition coefficients of iodine between benzene and water.
9. Preparation of buffer solution and determination of pH of a buffer solution.
10. Determination of Viscosity of lubricating oil by Red Wood viscometer II.
11. Determination of Flash point of given oil by Pensky-Marten's flash point approach.

Reference:

Laboratory Manual for Engineering Chemistry, B. B. Patra, Pearson Education, 1st edition, 2010

ESEE7106	Basic Electrical Engineering Lab	0-0-3	Credit 1

List of Laboratory Experiments/Demonstrations: (any six)

1. Study of different electrical equipments.
2. Power factor improvement using capacitor for fluorescent lamp.
3. Verification of Superposition and Thevenin's theorem.
4. Polarity test of transformer.
5. Power measurement using 2-wattmeter method.
6. Calculation of current, voltage and power in series R-L-C circuit excited by single- phase AC supply and calculation of power factor.
7. Measurement of the armature & field resistance of D.C. Machine by volt-amp method & Starting and speed control of a D.C. shunt motor.
8. Study of BH Curve

ESEC7107	Basic Electronics Engineering Lab	0-0-3	Credit 1

1. Familiarization of electronic components and devices (Testing of semiconductor diodes and transistors using digital multimeter)

2. Familiarization with use of Oscilloscope, signal generator to view waveforms and measure amplitude and frequency of a given waveform.
3. Application of Op-Amp as Differentiator and Integrator.
4. Verification of V-I characteristics of semiconductor diode and determining its DC and AC resistance.
5. Studies on half-wave and full-wave rectifier circuits without and with capacitor filter; recording of the waveforms and measurement of average and rms values of the rectifier output.
6. Plot the Input and Output V-I Characteristics of N-P-N Transistor in CE Configuration.
7. Determine the frequency response of a BJT common-emitter RC coupled amplifier.
8. Design a Low pass and High pass filter and verify its performance.
9. Verify truth table of Logic gates.
10. Simplify a Boolean expression and implement the function using Logic gates. Modify the circuit for implementation with NAND Gatesor NOR Gates only.

ESCE7108	Basic Civil Engineering Lab	0-0-3	Credit 1

List of Experiment are

1. Shape and Size Test of Brick
2. Compressive Strength of Brick
3. Specific Gravity of Cement
4. Testing of Chain and Measurement of Correct Length of the Line.
5. Bearing of a Line
6. Study of Total Station
7. Support Reactions of a Beam
8. Calculate the force in the Member of a simple Truss
9. Turbidity of Water
10. pH of Water

ESME7109	Basic Mechanical Engineering Lab	0-0-3	Credit 1

1. To study the working and construction details of Cochran and Babcock & Wilcox Boiler
2. To study the working and function of mountings and accessories in boilers
3. To study Two stroke & Four stroke Diesel Engines
4. To study Two-stroke & Four-stroke Petrol Engines
5. To study the vapour compression Refrigeration System and determination of its C.O.P
6. To study the functioning of Window Room Air Conditioner
7. To study the Constructional features and working of Pelton Wheel Turbine, Francis Turbine and Kaplan Turbine
8. To study the construction & working of centrifugal pump

9. To study the working of single plate clutch
10. To study different type of gears used for power transmission.

HSHM7102	Communicative English Lab	0-0-3	Credit 1

Lab sessions will be devoted to practice activities based on all three modules of theory.

A. Phonemic Transcription (5 Hours)

Students will be trained to find out the correct pronunciation of words with the help of a dictionary, to enable them to monitor and correct their own pronunciation.

i. Transcription of words and short sentences in normal English orthography (writing) into their IPA equivalents;

ii. Transcription of words presented orally;

iii. Conversion of words presented through IPA symbols into normal orthography

iv. syllable division and stress marking (in words presented in IPA form)

B. Listening (10 Hours)

i. Listening with a focus on pronunciation (ear-training) : segmental sounds, stress, weak forms, intonation

(Students should be exposed, if possible, to the following varieties of English during listening practice: Standard Indian, British and American.)

C. Speaking (15 Hours)

i. Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences
ii. Practising word stress, rhythm in sentences, weak forms, intonation
iii. Reading aloud of dialogues, poems, excerpts from plays speeches etc. for practice in pronunciation

D. Managerial Writing (6 Hours)

Business letters, Advertisement, Preparing Press Releases, Press Notes, Writing theme speeches, Speeches of thanks.

Course Outcome:

1. Demonstrate preparation and research skills for oral presentations
2. Develop proper listening skills
3. Articulate and enunciate words and sentences clearly and efficiently
4. Show confidence and clarity in public speaking projects
5. Demonstrate ability to gather information and apply it to persuade or articulate one's own point of view
6. Understand the rules of spelling and grammar

7. Read and analyze text and be able to summarize ideas in writing
8. Organize thoughts in a manner that emphasizes flow and paragraph development
9. Understand different writing techniques

ESCS7110	Programming Language using C Lab	0-0-3	Credit 1

At least five C programs from each of the following category

1. Tokens, data types, operators and expressions.
2. Non-formatted and formatted IO.
3. if, nested if-else, switch.
4. while, do-while and for.
5. continue, break, goto.
6. One-dimensional and two-dimensional operations.
7. Pointers and pointer arithmetic, pointers to arrays, pointers to pointers.
8. Functions, recursion, pointers to functions.
9. Structures, unions and enumerations, pointers to structures and unions.
10. Files and command line arguments.
11. Dynamic memory allocation.

ESCE7111	Engineering Graphics & Design Lab	0-0-3	Credit 2

Introduction: Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line Conventions

AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used toolbars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.

(**2 – Sheets)**

Orthographic Projections: Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only),True and apparent lengths, True and apparent inclinations to reference planes

(2 – Sheets)

Orthographic Projections of Plane Surfaces (First Angle Projection Only): Introduction, Definitions– projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only

(1-Sheets)

Projections of Solids (First Angle Projection Only): Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.

(**2-Sheets)**

Sections and Development of Lateral Surfaces of Solids: Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.

(2 – Sheets)

Isometric Projection (Using Isometric Scale Only): Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cutspheres.

(2-Sheets)

Text Books:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi
3. Engineering Drawing by N.S. Parthasarathy and Vela Murali Oxford University Press

Reference Books:

1. Engineering Graphics - K.R. Gopalakrishna, Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Computer Aided Engineering drawing, Prof. M. H. Annaiah, New Age International Publisher, New Delhi

ESME7112	Workshop Practice	0-0-3	Credit 2

List of Experiments are:

1. Machine shop
2. Fitting shop
3. Carpentry
4. Welding shop

5. Casting
6. Smithy
7. Plastic moulding & Glass Cutting

BSMA1106	Mathematics-II	3-1-0	Credit 3

Module 1: Basic Probability (14 + 4 Hours)

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Module 2: Continuous Probability Distributions (5 + 2 Hours)

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Module 3: Bivariate Distributions (5 + 2 Hours)

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

Module 4: First order ordinary differential equations (8 + 3 Hours)

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.

Module 5: Ordinary differential equations of higher orders (10 + 3 Hours)

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Textbooks:

1. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. Ch-8(8.7-8.12), 9(9.1-9.3, 9.6, 9.7), 10(10.1, 10.2), 11(11.3-11.5), 26(26.3-26.5), 27(27.1-27.9, 27.12, 27.13), 30.9,31.1.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, **8th** Edition, John Wiley & Sons, 2006.
2. Thomas G.B. and Finney R.L., Calculus and Analytic geometry, **9th** Edition, Pearson, Reprint, 2002.
3. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, **35th** Edition, 2000.
4. Peter V.O'Neil, Advanced Engineering Mathematics, Thomson Publisher, India edition.

ESCS2105	Programming Language using C	3-0-0	Credit 3

Course Objective:

This course aims at providing a concrete knowledge of the C programming language to the undergraduate students. They will be able to develop logics for different computational problems and implement them through C. By learning the basic programming constructs the students can switch over to any other language in future.

Course Outcomes:

CO1: Understand the programming paradigms and structure programming concept.

CO2: Develop flowcharts and algorithms to solve problems and implement them through C.

CO2: Use basic programming constructs like operators, control statements and arrays to write C programs.

CO3: Exercise pointers, user-defined functions and data types to write C programs.

CO5: Use files and associated operations for a given application.

Module I **(8 Hours)**

Preliminaries: Introduction to digital computers, Binary arithmetic, Binary conversion,

Programming Classifications, Structured Programming Concept, Algorithms, Flowcharts, Developing Programs In C, Structure of a C Program, Tokens in C, Data Types, Operators and Expressions, Lvalues and Rvalues, Type Conversions.

Console IO: Non-formatted and Formatted IO

Module II **(10 Hours)**

Control Statements: Decision Making - If, Nested if-else and Switch, Iterations- While, Do-While and For, Jumps - Continue, Break and Goto.

Arrays and Strings: Declaration, Initializing, Accessing Array Elements in One Dimensional and Multidimensional Arrays, Primitive Operations on Them, Applications of Arrays, Concept of Strings, Array of Strings.

Module III **(12 Hours)**

Functions: Concept of Functions, Defining, Declaring and Calling Functions, Call by Value, Passing Arrays to Functions, Scope and Extent, Storage Classes, Inline Functions, Recursion.

Pointers: Pointer Variable and its Importance, Declaring and Initializing Pointers, Dereferencing, Arrays and Pointers, Pointers and Strings, Pointer Arithmetic, Pointers to Pointers, Array of Pointers, Pointers to an Array, Arrays, Pointers to Functions, Dynamic Memory Allocation.

Module IV **(10 Hours)**

User Defined Data types: Structures, Unions and Enumerations.

Files: Concept of Files, Defining and Declaring a File, Opening and Closing a File, Input/output Operations in Files, Random Access to Files, Error Handling.

Advanced Features: Command Line Arguments, Working with Pre-Processor Directives.

Text Books:

1. Pradip Dey, Manas Ghosh, "Programming in C", Second Edition, Oxford University Press, 2011. (Module 1: Chapters 1-3, Module 2: Chapters 4-5, Module 3: Chapters 6-7, Module 4: Chapters8-9,11)
2. R.Thareja, "Introduction to C programming, July 2015, Oxford University Press.

Reference Books:

1. Brian W. Kernighan, Dennis Ritchie, "The C Programming Language" (2nd Edition), 1988, Prentice Hall.
2. E. Balagurusamy, "Programming in ANSI C", 4th edition, 2007, McGraw-Hill Publication, New Delhi.
3. K.R. Venugopal, S.R. Prasad, "Mastering C", McGraw-Hill Education India
4. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.

HSHM3101	Communicative English	3-0-0	Credit 3

Objectives:

1. To develop the communication skills of the students
2. To improve students' pronunciation in English
3. To enhance the ability to use targeted grammatical structures meaningfully and appropriately in oral and written production
4. To improve their general English knowledge that can assist them towards achieving their goal of effectively communicating in English
5. The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills

Module-I **(8 Hours)**

1. The Basics of Communication

Types of communication, The process of communication and factors of communication: sender, receiver, channel, code, topic, message, context, feedback, 'noise', filters and barriers, The importance of audience and purpose, The information gap principle: given and new information; information overload, Verbal and non-verbal communication: body language , Paralinguistic of features, Comparing general communication and business communication

Module-II **(12 Hours)**

2. The sounds of English

Vowels, diphthongs, consonants, consonant clusters, Problem sounds, The International Phonetic Alphabet (IPA); phonemic transcription, , Syllabic division and word stress, Sentence rhythm and weak forms, Contrastive stress in sentences , Intonation: falling, rising and fall-rise tones, Varieties of Spoken English: Standard Indian, American and British

Module-III **(12 Hours)**

Reading and Writing

Comparing reading and writing

3.1. Reading: Sub -skills of reading

Reading for comprehension, Comprehending the text, Skimming, Scanning, Getting the meanings of unfamiliar words, Note making, Summarising.

3.2. Mechanics of Writing

Process of writing, Paragraph writing, Business and Official Letters (Good news, bad news, Neutral messages), Report and Proposal writing, Notice, Circular and Memo writing, Résumé (CV) Writing.

.

Module-IV **(8 Hours)**

Grammar in Context

Time, Tense and Aspects, Use of Modal Verbs, Passive and Active Voice, Conditionals Reported Speech, Elimination of Common Errors.

Recommended Books:

1. Das, B.K. et al. An Introduction to Professional English and Soft Skills: Cambridge University.
2. Kumar, Sanjay & PuspLata. Communication Skill: Oxford University Press.
3. Conner, J.D.O. Better English Pronunciations: Cambridge University Press.
4. Leech, G.N. and Jan Svartik. A Communicative Grammar of English: OUP.

Reference Books:

1. Raman, Meenakshi. & Sangeeta Sharma .Technical Communication, Principle and Practice: Oxford University Press.
2. Chaturvedi & Chaturvedi. Business Communication- Concepts, Cases & Applications: Pearson.
3. Rai,Urmila. and S M Rai. Communication for Management: HPH.

ESME2113	Engineering Mechanics	3-1-0	Credit 3

Couse Objective:

A working knowledge of statics with emphasis on force equilibrium 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.

Module 1: **(6 Hours)**

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.

Module 2: **(4 Hours)**

Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;

Module 3: **(4 Hours)**

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;

Module 4: **(8 Hours)**

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.

Module 5: **(6 Hours)**

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.

Module 6: **(6 Hours)**

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).

Module 7: **(6 Hours)**

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.

Text/Reference Books:

1. S. Timoshenko, D.H. Young, J.V. Rao (2017), Engineering Mechanics, 5th Edition, McGraw Hill
2. S.S. Bhavikatti (2016), Engineering Mechanics, New Age International Publishers
3. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
4. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
5. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
6. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
7. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
8. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
9. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
10. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
11. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
12. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

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

- Use scalar and vector analytical techniques for analyzing 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 mathematics 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.

MCGN9101	Induction Programme	(21 Days)	Credit 0

Couse Objective:

To make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

(3 weeks duration)

Physical activity:

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6am for light physical exercise or yoga. There would also be games in the evening. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

Creative Arts:
Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

Universal Human Values:
A module in Universal Human Values gets the student to explore one self and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc.

It must get students to explore and think by engaging them in a dialogue through group discussions and real life activities rather than lecturing. It is essential for giving exposure, guiding thoughts, and realizing values. The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

Literary Proficiency:
Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

Proficiency Modules:
This period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially.

Lectures by Eminent People:
This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

Visits to local Areas:
A couple of visits to the landmarks nearby, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the underprivileged.

Familiarization to Dept./Branch and Innovations:
The students should be told about different method of study compared to coaching that is needed at the Technical Institutes. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other

facilities.

References:
Motivating UG Students Towards Studies, Rajeev Sangal, IIT BHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

MCGN9102 (D)	Professional Ethics	2-0-0	Credit 0

Module-I

1. Introduction to Ethics:

1.1 Basic terms- Moral, Ethics, Ethical dilemma, Emotional intelligence
1.2 Moral development theories of Kohlberg and Piaget
1.3 View on ethics by Aristotle
1.4 Governing factors of an individual's value system
1.5 Personal and professional ethics

Module-II

2. Profession and Professionalism:

2.1 Clarification of the concepts: Profession, Professional, Professionalism, Professional accountability, Professional risks, Profession and Craftsmanship, Conflict of interest
2.2 Distinguishing features of a professional
2.3 Role and responsibilities of professionals
2.4 Professionals' duties towards the organization and vice-a-versa

3. Ethical Theories:

3.1 Various ethical theories and their application- Consequentialism, Deontology, Virtue theory, Rights Theory, Casuist theory
3.2 Ethical terms: Moral absolutism, Moral Relativism, Moral Pluralism etc.
3.3 Resolving Ethical Dilemma

Module-III

4. Ethics in Engineering:

4.1 Purpose and concept of Engineering Ethics
4.2 Engineering as social experimentation
4.3 Types of inquiry
4.4 Issues in engineering ethics

5 Engineers' Responsibility and Safety:

5.1 Safety, Risk, Underestimating the risk, Over estimating the risk, Risk-benefit analysis
5.2 Causes of an accident and identification of the preventive measures to be taken
5.3 Case Studies

Module-IV

6. Global Ethical Issues:

6.1 Different ethical issues in business, environment, IT, Bioethics, Intellectual Property Rights (IPR),

Research, Media, CSR etc.

7. Ethical Codes:

7.1 Meaning and the significance of ethical codes
7.2 The limitations of ethical codes.

Recommended Books For Reference:

1. R. Subramanian, "Professional Ethics" , Oxford University Press, New Delhi, 2013
2. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2013
3. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, 2003.
4. Daniel Albuquerque, "Business Ethics", Oxford University Press, New Delhi, 2013
5. Edmund G. Seebauer and Robert L. Barry, "Fundamentals of Ethics", Oxford University Press, New Delhi, 2012.