SANT GADGE BABA AMRAVATI UNIVERSITY GAZETTE

Official Publication of Sant Gadge Baba Amravati University

PART- TWO

(Extra-Ordinary)

Saturday, the 21st September, 2019

NOTIFICATION

No. 120 /2019 Date : 21/09/2019

Subject :- Implementation of new syllabi of Semester I & II of B.Tech. (Chem.Tech.) (Food, Pulp & Paper, Oil & Paint and Petrochemical Tech) **from the session 2019-2020 & onwards as per A.I.C.T.E. Model Curriculum...**

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabi as per A.I.C.T.E. Model Curriculum of Semester I & II B.Tech. (Chem.Tech.) (Food, Pulp & Paper, Oil & Paint and Petrochemical Tech). from the academic session 2019-2020 and onwards in phase wise manner as per **Appendix – A** :

Moreover, It is notified for general information of all concerned that the authorities of the University have accepted **Induction Program as per A.I.C.T.E. Guidelines** for Semester I as per **Appendix – B.**

Sd/-
(Dr.T.R.Deshmukh)
Registrar
Sant Gadge Baba Amravati University

Appendix – A

SYLLABUS PRESCRIBED FOR FOUR YEAR DEGREE COURSE IN BACHLOR OF TECHNOLOGY (CHEMICAL TECHNOLOGY) (FOOD, PULP & PAPER, OIL & PAINT AND PETROCHEMICAL TECH.,) SEMESTER PATTERN CREDIT GRADE SYSTEM

SEMESTER : FIRST

1 SCT1 APPLIED INORGANIC CHEMISTRY

Aim :
To impart a sound knowledge on the principles of inorganic chemistry involving the different application oriented topics required for Food, Petro, Pulp and Paper, Oil and Paint Technological branches.

Objectives :
The student should be conversant with :
- Concept of atomic structure, related various theories and principles.
- Knowledge with respect to water and various treatments of water.
- Utilization of engineering materials towards different applications.
- The principles involved in corrosion control.

SECTION-A

UNIT I : Atomic structure : Bohr's theory, Modern quantum theory of atom, deBroglie's equation, Exclusion Principle, Hunds rule, Aufbau principle, quantum number and distribution of electrons. Atomic size, ionization energy, factors determining ionization energy, electron affinity and electro negativity. **(8)**

UNIT II: Chemical Bonds and their types : ionic bond, covalent bond, metallic bond. Hydrogen bond, coordinate bond, odd electron bond, vanderwaals forces, lattice energy, Born Haber cycle, hybridization and molecular shapes, resonance. **(7)**

UNIT III: Water : Impurities in water and their effect on hardness, Estimation of hardness by EDTA and Soap solution method, softening of water, methods of softening : Lime Soda, Zeolite process and Ion Exchange method, problems based on Lime Soda & Zeolite process, industrial uses, boiler corrosion structure of water, concept of bond and free water. **(7)**

SECTION-B

UNIT IV: Alloys: Introduction, purpose of making alloys, composition, properties, different types of alloys, carbon steel, copper (Brass, Bronze) , Nickel, Aluminum, Tin. **(7)**

UNIT V: Corrosion: Definition, factors affecting the rate of corrosion, different types of corrosion, cathodic and anodic prote prevention against corrosion, protective coating, metallic, inorganic, organic coating and corrosion inhibitors. **(7)**

UNIT VI: Cement: Raw materials, compositions, manufacture, by wet and dry process , properties of cement, special cements.
Glass: Different kinds of glass, manufacture of glass color imparting on glass uses of glass.
Refractories: Classification, raw materials, manufactures, application in industry. **(9)**

**Text Boo : ** Chemical Process Industries: R.N.Shreve, McGraw Hill, New York.

Reference Boos:
1. Fundamental Concepts of Inorganic Chemistry: E.S.Gilbreath, McGraw Hill Kogukusha ltd, Int. students Edn.
2. Concise Inorganic Chemistry, J.D. Lee, Low Price Ed.
3. A Textbook on Engineering Chemistry: S.S.Dara.
4. Outlines of Chemical Technology .E.Dryden, East-west press New Delhi.
5. Basic Inorganic Chemistry, F.A.Cotton ,G.Wilkinson and P.L.Gaus, John Wiley & Sons, Inc, Singapore 3rd Ed,1996.

1 SCT APPLIED INORGANIC CHEMISTRY- LAB.

List of Experiments :

1. Determination of Normality and strength of Sodium hydroxide by Oxalic acid.
2. To determine the normality and strength of Hydrochloric acid by sodium hydroxide.
3. Determination of normality and strength of Oxalic acid by using potassium permanganate solution.
4. Determination of permanent NaOH and Na_2CO_3 in the given alkali mixture solution.
5. Determination of $NaHCO_3$ and Na_2CO_3 in the given alkali mixture solution.
6. Determination of hardness of water by using EDTA method.
7. Determination of free chlorine in a water sample.
8. Estimation of copper iodometrically using hypo solution.
9. Estimation of Zinc in the given sample.
10. Estimation of Iron from the given solution.
11. To estimate amount of Tin in the given stannous chloride solution.
12. To estimate the percentage of lime in cement.
13. To determine the amount of copper in given sample of brass.
14. To estimate the percentage of iron in plain carbon steel.

NOTE : At least **EIGHT** laboratory experiments mentioned above have to be performed**.**

1 SCT 2 / I A2 ENGINEERING PHYSICS

Course Objective :
To enable the students to correlate the theoretical principles of fundamentals of modern aspects in Physics with application oriented studies of engineering.

Coruse Outcome:

At the end of the course the students would be exposed to fundamental, knowledge in:
- Electromagnetic phenomena and wave propagation.
- Interferometric techniques in metrology, communication.
- Application of quantum physics to optical & electrical phenomena.
- Application of lasers and Fiber Optics in Engineering and Technology.
- Conducting, superconducting and dielectric materials.
- Semi conducting and new engineering materials.
- Physics of Modern engineering materials.
- Application of ultrasonic's, acoustics.

SECTION-A

Unit I: Solid State Physics: Classification of solids on the basis of energy band diagram, Covalent bonds, bound & free electrons, holes, electron and hole mobilities, Intrinsic and Extrinsic semiconductors, energy band diagram for semi-conductors. Fermi and Impurity levels, semi-conductor conductivity with derivation, Law of mass action (only statement), P-N junction diode, Zener diode, Light Emitting Diode. Hall effect. (9)

Unit II: Modern Physics: Planck's hypothesis, properties of Photons, Compton effect, De-Broglie's concept of matter waves, wave particle duality, Heisenberg's Uncertainty Principle (only statement), applications of uncertainty principle (electrons cannot exists in the nucleus and binding energy of electron in atom), wave function and its significance, time independent Schrodinger equation. (7)

Unit III : Electric and Magnetic Fields : Motion of electron in uniform transverse electric field and transverse magnetic fields, velocity selector (energy filter), positive rays, Bainbridge mass spectrograph, Cathode ray oscilloscope : block diagram and working of each block. (7)

SECTION-B

Unit IV: Interference and Diffraction: Fundamental condition of interference, thin film interference due to reflected light, Newton's ring; equation for radius of bright and dark rings, determination of wavelength, R. I. of medium using Newton's ring. Fresnel and Fraunhoffer class of diffraction, single slit diffraction, plane transmission grating; construction and determination of wavelength of light using grating, dispersive power of grating. (7)

Unit V: Fibre Optics and LASER: Principle and construction of optical fibre, acceptance angle and acceptance cone numerical aperture, types of optical fibres and refractive index profile, attenuation in optical fibres, different mechanisms of attenuation, application of optical fibres.; LASER: spontaneous and stimulated emission of radiation, Pumping, Optical Pumping, Ruby LASER (Construction and Working), Characteristics & Applications of Laser in Industrial, Medical and Scientific field. (7)

Unit VI: Acoustics: Sound waves, reflection of sound waves, defects due to reflected sound (echo and reverberation), absorption of sound, Sabine's formula for reverberation of time, Factors affecting architectural acoustics and its remedies. Ultrasonics: Ultrasonic waves, Production of Ultrasonic waves (piezo-electric and magnetostriction methods), properties of Ultrasonic waves and applications. Fluid dynamics: Viscosity, Stoke's law, liquid flow (streamline and turbulent), flow of liquids through a capillary tube (Poiseuille's equation), Continuity equation, Bernoulli's theorem (only derivation). (7)

Text Boo□s:

1) M.N. Avadhanulu & P. G. Kshirsagar: Engineering Physics, S. Chand Pub., 2008
2) Dr. (Mrs.) S. D. Wakde & J. S. Bakare: Engineering Physics, SSGMCOE, 2004

Reference Boo□s:

1) R. K. Gaur & S. L. Gupta: Engineering Physics, Dhanpat Rai & Sons.
2) Hitendra K. Malik & A. K. Singh: Engineering Physics, Tata McGraw Hill
3) Beiser: Mordern Physics, Tata McGraw Hill
4) Mani & Mehta: Mordern Physics, Affiliated East- West Press
5) N. Subrahmanyam, Brijlal, M. N. Avadhanulu: A Text Book of Optics, S. Chand & Company.

1 SCT7 / 1 A □ ENGINEERING PHYSICS – Lab.

Practicals :

1) Determination of Band gap energy of semiconductor.
2) To study the forward and reverse characteristics of P-N junction diode.
3) To study the reverse characteristics of Zener diode.
4) To study the forward characteristics of Light Emitting Diode.
5) To determine the wavelength of monochromatic light by Newton's Rings method.
6) Determination of wavelength of spectral lines using diffraction grating.
7) Determination of grating element of a diffraction grating using LASER beam.
8) Study of Hall Effect
9) Amplitude and frequency measurement of ac signal using CRO
10) Study of CRO
11) Determination of unknown frequency of ac signal using Lissajious spattern
12) To determine resolving power of telescope
13) Determination of Planck's constant using photocell
14) To determine the coefficient of viscosity of water by capillary flow.
15) To determine the specific charge (e/m) of electron by Thomson method.
16) Experiment on the basis of Non Destructive Testing.

(Note: Minimum 08 experiments shall be conducted)

1 SCT 3 / I A1 ENGINEERING MATHEMATICS - I

Aim :

The aim of this course is to familiarize the prospective engineers with techniques in differential calculus and equations. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Objectives:

1. To identify algebraic problems from practical areas and obtain the solutions in certain cases
2. To understand maxima and minima concept.
3. To solve differential equations of certain types, including systems of differential equations that they might encounter in the same or higher semesters.

Course Outcomes:

On completion of the course the students will learn to:

- Able to understand Rolle's Theorem and its applications to Engeering Problems.
- Able to understand maxima minima concept.
- Able to apply Demoiver's theorem in various concepts of complex number.
- Able to solve differential equations of certain types that they might encounter in the same or higher semester.

SECTION - A

Unit I : Differential Calculus :

Successive Differentiation, Leibnitz's Theorem, Rolle's Theorem, Mean value theorem, Expansions of function using Taylor's and Maclaurin's theorems; Indeterminate Forms Using L'Hospital Rule. (8)

Unit II: Multivariable Differential Calculus :

Partial differentiation, total differential coefficients, exact differential, Euler's theorem on homogeneous function, Maxima & Minima of a function of several connected independent variables (Lagrange's multipliers). (8)

Unit III : Complex Numbers :

Demoiver's theorem and its applications, Hyperbolic and inverse hyperbolic functions, separation of real and imaginary parts, Logarithm of complex numbers. (8)

SECTION –B

Unit IV: - First order and First Degree Ordinary Differential E□uations :

Ordinary differential equations of first order and first degree in various Forms, (Variable separable, linear differential equation, homogeneous differential, exact differential equation) and reducible to above forms, methods of substitution. (8)

Unit V : **First order and Higher Degree Ordinary Differential E□uations :**

Solution of differential equation of first order and higher degree by various methods.

Applications of Ordinary Differential E□uations :

Applications of differential equations of first order and first degree to the problems on orthogonal trajectories and Electrical engineering. (8)

Unit VI :**Se□uences and Series**

Convergence of Sequence and Series, Test for Convergence, Comparison Test, Ratio Test, Root Test, Raabe's Test, Range of Convergence. (8)

Text / Reference Boo□s :

i) Wartikar P.N . , Wartikar J.N. – A text of applied Mathematics, Volume I, II, Pune V.G. Prakashan, Pune.
ii) Grewal B. S. – Higher Engineering Mathematics, (latest Edition), Khanna Publishers .
iii) Kreyszig E.K. – Advanced engineering Mathematics, John Wiley.
iv) Ramana B. V. - Higher Engineering Mathematics, (TMH).
v) Singh R.R. And Bhatt M. - Higher Engineering Mathematics, (TMH).
vi) N.P.Bali and Manish Goyal – A text book of Engineering Mathematics, Laxmi Publications.
vii) Veerarajan T. Engineering mathematics for first year,(TMH).

1 SCT □/ I A□ COMPUTER PROGRAMMING

Aim: The course is aimed at impart knowledge to analyze, solve, design and code real-life problems using C language

Course Outcomes: At the end of course, the students will be able -

To explain fundamental concepts of computer and computing.

To test and execute the programs and correct syntax and logical errors.

To implement conditional branching, iteration and recursion.

To use arrays, pointers and structures to formulate algorithms and programs.

To recognize various problem solving techniques and computer applications.

To apply programming concepts to solve real life problems.

UNIT I: **Fundamental of the Computer and Computing Concepts** : Generation of computers, Classification of computers, Basic Anatomy of Computer System, Input Devices, Processor, Output Devices, Memory Management, Types of Computer Software, Overview of Operating system, Networking Concepts, Microsoft Office, Number systems: Decimal, Binary, Hexadecimal, Octal, Conversion of Numbers, Binary Arithmetic Operations, Programming Languages, Logic gates (8)

UNIT II: **C Fundamentals :** Introduction, Importance of C, Basic Structure of C Programs, Program execution, Basic programs based on C such as Printing Message, Adding two numbers, Interest calculations, Use of subroutines, math function. C tokens, Keywords and Identifiers, Character set, Data Types, Constant and Variables, Declaration of Variables, Declaration of Storage Class (8)

UNIT III: **Operators, Expression and Input-Output operation** : Operators, Types of Operators: Arithmetic, Relational, Logical, Assignment, Increment-decrement, Conditional, Bitwise, Special. Arithmetic expression, Evaluation of Expression, Precedence of Arithmetic Operators, Input-Output Operation: Reading and Writing Character, Formatted Input, Formatted Output. (8)

UNIT IV: C Control constructs : Decision-making using if, if-else, nested if, else if ladder and switch-case statements, ?: Operator, Goto Statement, Loops using for, while, do-while statements, break and continue statements, Jumps in Loops, Concise Test Expressions. (8)

UNIT V: Array, Strings and Structures: Introduction to array, One Dimensional Array: Declaration & Initialization, Two Dimensional: Declaration & Initialization, Multi Dimensional, Strings: Declaration and Initialization, Reading String from terminal, Writing String to Screen, Putting Strings together, Comparison of Two Strings, String-Handling Functions, Table of Strings, Other features of String, Structures – Define, Declaration, Accessing the members of a structure

(8)

UNIT VI: User Defined Functions, Pointers and File Management : Functions, Need for User defined Functions, Multi Function Program, Elements of User Defined Functions, Return Values and their types, Function Calls, Function Declaration, and Categories of Functions. Definition and uses of pointers, Accessing the address of a variable, Introduction to File Management, Defining and Opening File, Closing File, Input/output Operations on File. (8)

Text Boo : E Balagurusamy: Computing Fundamentals & C Programming|| – Tata McGraw-Hill, 2nd Edition .

Reference Boos:

1. Pradeep Dey and Manas Ghosh, " Computer Fundamentals & Programming in C" Oxford University Press, 2006.
2. K R Venugopal and S R Prasad,"Mastering C" Tata-McGraw Hill.
3. Seymour Lipschutz, "Data Structure Using C", Tata-McGraw Hill.
4. Herbert Schildt - C Complete Reference (Tata-McGraw Hill).

1 SCT8 / 1A8 COMPUTER PROGRAMMING- LABORATORY

Based on the Syllabus of 1A4 Computer Programming – Minimum Eight (8) experiments be performed preferably covering all the Units.

1SCT 5 MECHANICAL TECHNOLOGY

Aim :

The course is aimed at developing the basic Mechanical Engineering knowledge to technology students that are imperative for effective understanding of Mechanical processes and operation.

Objectives :

On completion of the course the students expected :
- to understand the manufacturing process, metals and alloys.
- to basic principles of casting, patterns, mould making and its technology.
- to understand theory of metal cutting, speed transmission and motion.
- to specify, identify and classify operators of Lathe, Drill and grinding.
- to understand various joining processing and operations like Welding, Solderging and Brazing.

Section – A

Unit I : Introduction to manufacturing process. Fundamentals of metals and alloys. Different engineering materials, properties. Ferrous and non – Ferrous non - metals used in foundry. (7)

Unit II : Introduction to pattern making- Pattern materials, tools, pattern making allowances. Types of patterns, General properties of moulding sands, Basic principle and Terminology, tools of sand casting, types of gate risers and runners,. Preparation of sand moulds of different types, core making. (7)

Unit III : Casting process and their principle of operation and applications permanent mould casting, slush casting, investment casting, centrifugal casting, continuous casting, die casting equipment and processes, and casting methods. Casting inspections, casting defects, their causes and remedies. (9)

Section – B

Unit IV : Theory of Metal cutting, Tool material, Tool Geometry, Tool life, Tool wear, Machinability, Metal cutting economy, Cutting fluid, Machine Tool classification. Speed transmission by belts, simple and compound gear trains, and quick return mechanism for motions. (8)

Unit V : Specification, construction, operations and accessories of Lathe, Shaper, Drill and Grinder. Facing, Turning, Screw cutting, Drilling, Shaping, and Cylindrical grinding operations. (7)

Unit VI : Joining Processes, Brazing, Soldering and Welding, Gas Welding. Electric are and resistance welding, hermit welding. (7)

Text Boo : Elements of Workshop Technology, Vols. I and II by S.K.Hajra Choudhary and S.K.Bose, Asia Publishing House, Bombay, 2nd Edition.

Reference Boos :

1. Production Technology By.R.D.Jain and B.C.Gupta, Khanna Publisher Delhi 1972.
2. Production Technology, Vols. I, II and III by W.A.J.Chapman, Edward Arnold Publishers, Ltd. London. 1961.
3. Process and Materials of Manufacture by R.A.lindberg, PHI Pub.
4. Workshop Technology Vol. I & II by Bawa

SEMESTER : SECOND

2 SCT1 APPLIED PHYSICAL CHEMISTRY

SECTION A

UNIT I: Basic principle of wave mechanics, Schrodinger wave equation,application of Schrodinger wave equation , linear harmonic oscillator, Activity and activity coefficient, Gibbs Duhem equation. (7)

UNIT II: Kinetic molecular theory of gases: Equation os state of ideal and real gases, Distribution of molecular speeds in an ideal gas, Molecular collisions and mean free path, Vander Waals equation, Principle of corresponding states. (7)

UNIT III: Estimation of molecular diameter , molecular velocities, Root means square velocity (RMS) , average velocity and most probable velocity ,collision number, collision frequency, critical constants, diffusion, heat conduction in gases numericals. (7)

SECTION B

UNIT IV: Chemical Kinetics: Scope of kinetics, elementary reaction steps and rate expression , complex reactions and their molecularity and order determination, factors affecting reaction rate, integrate rate expression of zero, first, second and third order reaction with examples, numericals. (8)

UNIT V: Methods for determination of order of reaction: Integration methods, graphical method, isolation method, Von't-Hoff method and fractional change method, half life period, energy of activation, Arrhenius equation, numericals. (8)

UNIT VI: Thermodynamics: Objective and scope of thermodynamics, definition of thermodynamics system, state, property, first law of thermodynamics, second law of thermodynamics, processes, enthalpy, free energy, Gibbs Helmholtz equation. (7)

Text Boo : Text Book of Physical Chemistry : P.L.Sony, Sultan Chand and Sons, New Delhi.

Reference Boos :

1. Physical Chemistry : G.M.Barrow . Benjamin Publication.
2. Thermodynamic for Chemist: Glasstone, S. Affiliated, East Press , New Delhi.
3. Advance Physical Chemistry: Gurudeep Raj, GEOL, Publication, Meerut.
4. Physical Chemistry, P.W.Atkins, Oxford University. Press 8th Ed.

2 SCT APPLIED PHYSICAL CHEMISTRY- LAB.

List of Experiments :

1. To determine the Surface tension of given sample by stalagmometer method.
2. To determine the viscosity of a given liquid by Ostwald viscometer.
3. To study the partition coefficient of iodine between organic solvent and water.
4. To study the hydrolysis of ethyl acetate in presence of sodium hydroxide.
5. To study the hydrolysis of an ester in presence of hydrochloric acid
6. To investigate the autocatalytic reaction between potassium permanganate and oxalic acid.
7. To determine energy of activation of the reaction between potassium persulpahte and potassium iodide.
8. To determine the refractive index of given liquids by Abbe's refractometer.
9. Determine the specific and molar refraction of a given liquid by Abbe's refractometer.
10. Kinetic study of Second order reaction of equal concentration.
11. To Determination heat of neutralization HCl by NaOH.
12. To Determination the integral heat of solution of KNO_3.
13. Determine the solubility of benzoic acid in water at different temperature and hence its heat of solution.
14. To study the effect of addition of an electrolyte on the solubility of monobasic organic acid at room temperature.

(NOTE: Minimum **EIGHT** laboratory experiments shall be conducted**)**

2 SCT2/ 1B3 BASIC ELECTRICAL ENGINEERING

Course Objectives:

1] To introduce students with different terminologies in electrical engineering and different theorems.
2] To understand magnetic circuits.
3] To study A.C. fundamentals.
4] Study of polyphase circuits.
5] To acquire the knowledge about electrical machines and transformer
6] To study different measuring instruments and electrical apparatus and safety (earthing).

Course Outcomes:

A student completing this course should able to do the following:

1] Explain the basic concepts of electric and magnetic circuits.
2] The students will be able to solve problems on AC fundamentals & three phase circuits
3] Explain the operating principles of various electrical machines and describe the working of various measuring instruments and importance of earthing.

SECTION-A

Unit I: Basic concepts of Voltage, Current, Power, Energy and relationship between them Resistance, Resistivity, Conductivity, Temperature effect on resistance and temperature coefficient of resistance. Series and parallel circuits, Ohm's law, Kirchoff's laws, Superposition theorem, Thevenin's theorem, Star-Delta transformation (8 Hrs)

Unit II: Magnetic Circuit & Electromagnetism :Basic concept of Magnetic flux, Flux density, MMF, Reluctance, Magnetic field intensity and their relationship, Series and Parallel Magnetic circuits, Principles of Electromagnetic induction, self and mutual inductance, Leakage and fringing of flux, coefficient of coupling and Magnetization curves. (8 Hrs)

Unit III: A.C. Fundamentals, RMS, Average values, form factor, peak factor for Sinusoidal Wave form only, Single phase A.C. Series circuit with Resistance, Inductance and Capacitance, phasor Diagram. Single phase A.C. Parallel circuit with Resistance, Inductance and Capacitance, phasor Diagrams. Impedance Triangle, Active and Reactive power. (8 Hrs).

SECTION-B

Unit IV: Polyphase Circuits, Balanced Three phase circuits, Production of three phase emf, Star and Delta connections. Relationship of Phase and line values of voltage and current for Star and Delta circuits, Star and Delta balanced load. (7Hrs.)

Unit V: Electrical machines **A**) Single Phase Transformer, Construction and working (no load & on load), EMF Equation, Losses, Efficiency, Regulation and phasor diagram.

B) Electromechanical Energy Conversion, Working principle, Construction of D.C. Motors, types of dc motor, characteristics and applications of D.C. Motors (8 Hrs)

Unit VI: Electrical Apparatus and safety, Measurement of Current, Voltage, Power, Energy, Construction and working of PMMC, MI, Electro-dynamometer & Induction type Measuring Instruments. Necessity of earthing and types of earthing (Plate earthing & Pipe earthing) (7 Hrs)

Text Boo□s / Reference Boo□s: - .

1. Basic Electrical Engineering , First Ed., Kulshreshtha D.C., TMH
2. D. P. Kothari & I. J. Nagrath, "Basic Electrical Engineering", TMH Pub. Co. Ltd., New Delhi , 4th Edition
3. Basic Electrical Engineering, V. N. Mittle, TMH Publishing company Ltd
4. Basic Electrical Engineering, Fifth Edition, Fidzgerald A.E., TMH -2006.
5. Basic Electrical Engineering, First ed., R. Anand Natarajan & P. Ramesh
6. Principle of Electrical Engineering , 4th Edition, Del Toro V., PHI 2005
7. Basic Electrical Engineering –First ed., T. K. Nagsarkar, OXFORD University Press, 2005
8. Electrical Technology – Volume - I, B. L. Theraja, S. Chand & Co. Publication.

2 SCT7/ 1B7 BASIC ELECTRICAL ENGINEERING – LAB.

List of experiments in Basic Electrical Engineering:

(Minimum (8) eight experiments based on above syllabus]

1. To verify KCL and KVL .
2. To verify Superposition theorem.
3. To verify Thevenin's theorem
4. To verify the effect of temperature on conductor and temperature coefficient of resistance.
5. To analyze series RLC circuit
6. To analyze Star connected resistive circuit
7. To analyze Delta connected resistive circuit
8. To perform load test on a single phase transformer
9. To study D.C. Motors
10. To study measuring instruments

2 SCT3/ 1A3 ENGINEERING MECHANICS

Course Objectives :

Students will be taught -

1. Concepts related to Forces and its effects, resolution and composition of coplanar forces.
2. Application of principles of statics to the system of rigid bodies.
3. Analysis of simple structures like trusses and beams.
4. Concepts related to friction, its application.
5. Concepts related to centroid, moment of inertia, radius of gyration and product of inertia and its application.
6. Concepts related to kinematic and kinetic equations, and its applications to various types of motion.
7. Concepts related to conservation of momentum and laws of impacts.

Course Outcomes :

At the end of course students will be able to -

1. Compose and resolve the forces along with its effect.
2. Apply principles of statics to the system of rigid bodies and analyse simple structures.
3. Calculate frictional forces for simple contact, wedges and belt friction.
4. Locate centroid and calculate moment of inertia.
5. Calculate various kinematic quantities.
6. Solve the problems using different kinetic equations related to direct and interconnected particles.
7. Apply principle of conservation of momentum and laws of impact.

SECTION - A

UNIT-I (STATICS) :

Resultant: Concept of a force, force systems, moment of a force about a point, couple, resolution and compositions of coplanar forcesystem.

E□uilibrium: Free-body diagrams, equations of equilibrium, problems ofequilibrium involving co-planar force system acting on a particle,rigid body and system of rigid bodies. (09)

UNIT-II (STATICS) :

Trusses: Definitions, assumptions, types, Analysis of simple plane perfect trusses by method of joints and method of section.

Friction: Definitions of friction, types, angle of friction, angle of repose, cone of friction, Coulomb's laws of friction. Applications to simple contact friction, wedges and belt friction. (09)

UNIT-III : Centroid, First Moment of Area, Problem on Centroid of composite sections, Second Moment of Area, Radius of Gyration,product of inertia, perpendicular and parallel axis theorem, polar moment of inertia, radius of gyration, Definition of principal axes and principal moment of inertia. (07)

SECTION - B

UNIT-IV (DYNAMICS - □INEMATICS) :

Definitions of displacement, velocity and acceleration and their relations, rectilinear motion under variable & constant accelerations, curvilinear motion using rectangular coordinates, normal and tangential components(involves Problems on calculation of total acceleration, radius of curvature and projectile motion). (06)

UNIT-V (DYNAMICS – □INETICS) :

Kinetics of rectilinear, curvilinearand rotatory motion of a particle actedupon by a force system, Application of D'Alembert'sprinciple, concept of dynamic equilibrium, rectilinear motion ofseveral interconnected particles, and rotation of rigid body about a fixed axis. **(**07)

UNIT-VI (DYNAMICS – □INETICS) :

Application of work-energy equation and impulse-momentum equation, law of conservation of momentum for aparticle and a system of particles in a rectilinear translation,direct central impact, collisionof two particles, coefficient of restitution.

Text Boo□s :

1) Bhattacharyya Basudeb, Engineering Mechanics, Oxford University Press.
2) Bhavikatti, S. S. and Rajashekarappa, K. G., Engineering Mechanics, New Age International Publishers, New Delhi.

Reference Boo□s :

1) Singer, F. L., Engineering Mechanics, Harper Collins Pub., Singapore
2) Timoshenko, S. P. and Young, D. H., Engineering Mechanics, McGraw-Hill International C.,Auckland.
3) Beer, F. P. and Johnston, E. R., Vector Mechanics for Engineers, McGraw-Hill International C., Auckland.
4) Shames, I. H., Engineering Mechanics, P.H.I. Pvt. Ltd., New Delhi.

2 SCT8 /1A7 ENGINEERING MECHANICS – Lab.

Course Objectives :

Students will be taught -

1. Performance of practicals based on concepts related to engineering mechanics.
2. Working of Lifting Machines

Course Outcomes :

Students will be able to -

1. Prove the concepts related to engineering mechanics.
2. Calculate lifting machine parameters.
3. Perform graphical analysis of force systems and simple structures.

Practicals :

(Two compulsory graphical solutions to the problems of statics)

1. Law of Polygon of forces
2. Reactions at the supports of simple beam.
3. Forces in members of Jib crane.
4. Determination of coefficient of friction on inclined plane.
5. Determination of Coefficient of coil friction.
6. Determination of law of machine for screw jack/differential axle wheel /single and double purchase crab(for any two machines).
7. Determination of mass moment of inertia of fly wheel
8. Determination of gravitational acceleration by compound pendulum.

2 SCT□/ 1B□ ENGINEERING GRAPHICS

Course Objectives:

1) To acquire and apply engineering graphics knowledge for communicating ideas, information and instructions, as well as to understand the conventions of engineering drawing
2) To understand the representations of 3D objects, their projections and sectional views
3) To understand the representations of orthographic and isometric views of 3D objects
4) To introduce students with the drafting commands of commercial graphics software.

Course Outcomes:

On successful completion of the course, the students will be able to attain following Course Outcomes:

1) Students will able to read/prepare/understand the engineering drawings
2) Students will able to create the projections and sectional views of 3D objects
3) Students will able to draw the orthographic and isometric views of 3D objects
4) Students will able to use graphics software to create Engineering drawings and represent engineering systems

SECTION A

Unit 1: Introduction to Engineering Drawing and Projection :
Use of various drawing instruments, concept of dimensioning and scales, geometric construction, projection of point, line and plane, projection on auxiliary plane.

Unit 2: Projection of Solids :
Projection of solids for prism, pyramid, cone and cylinder.

Unit 3: Section of Solids :
Section of solids for prism, pyramid, cone and cylinder.

SECTION B

Unit □: Orthographic Projection :
Conversion of pictorial view of objects to orthographic projections by using first and third angle projection methods
Unit 5: Isometric Views and Projections :
Construction of isometric views and projection of given two dimensional views
Unit □: Introduction to CAD Software :
Drafting environment and drafting screen, coordinate systems, drafting and dimensioning commands, editing commands, drafting of basic geometrical shapes, display commands, CAD software customization.

List of Boo□s Recommended :

Text Boo□s:

1. Bhatt N. D. & Panchal V. M. Engineering Drawing, 49th Edn., Charotar Pub. House, Anand, Gujrat, 2007.
2. Shah P. J. – Engineering Drawing, S. Chand Publication, 2008.
3. Dhawan R. K. – Engineering Drawing, S. Chand Publication, (5th edition, 2008).
4. Tickoo Sham – AutoCAD, BPB Publications.

Reference Boo□s:

1. Naraynan K. L., Kannaiah P. – Engineering Drawing, Scitech.
2. Jolhe D. A. – Engineering Drawing, Tata McGraw Hill Publication, 2008.

2SCT9/ 1B8 ENGINEERING GRAPHICS – LAB.

List of Practicals :

Every student will submit a set of at least SIX drawing sheets (from 1 to 7 listed below) and perform at least TWO practical (from 8 to 10 listed below) using CAD software. Examination will consist of viva-voce based on the syllabus.

1. Loci of points of various mechanisms
2. Projection of straight line
3. Projection of plane
4. Orthographic projection
5. Projection of solids
6. Isometric projection/view

7. Free hand sketches of simple machine elements, like :
   (a) Screw threads ISI profile
   (b) Types of nuts, bolts, studs, set screws, washers, locking arrangement of nuts & bolts
   (c) Foundation bolts – Rag, eye, lewis types
8. Drafting of basic 2D geometrical shapes using CAD software
9. Drafting of basic 3D geometrical shapes using CAD software
10. Drafting of 2D and 3D objects using surface modeling commands.

2 SCT5/ 1A5 WOR□SHOP / WOR□SHOP PRACTICE

Course Objectives :

- To give students 'hands on experience' of craftsmanship.
- To make students familiar with different work trades.
- To develop quality & safety consciousness amongst the students.
- To develop awareness of fire safety amongst the students.
- To develop respect towards labor work amongst the students.
- . To develop skill sets for creating entities from primitive engineering materials
- To develop skill sets for establish in connections through wires and cables.
- This exercise also aims at inculcating respect for physical work and hard labor in addition to some value addition by getting exposed to interdisciplinary engineering domains.

Course Outcomes :

Upon completion of this course, the students will gain knowledge of different manufacturing processes which are commonly employed in industry.

Upon completion of this course, the students will be able to fabricate the components using various manufacturing techniques.

The students will be conversant with the concept of dimensional accuracy and tolerances.

Performance :

Students should perform minimum six jobs out of following :

I) SMITHY: Introduction to smithy operations like upsetting, drawing ,bending, Forming; Tools- hammer, hot and cold chisels, swages ,drifts, flatters, tongs, anvils and various smithy tools & equipments ,their use. Forging Principle, forge welding, use of forged parts.

One job on smithy: Job involving upsetting, drawing down, flattering. Change of cross sectional area like round to rectangular or making a ring from a round bar, S – Hook, forming such as a square / hexagonal headed bolt, hook etc.

II) FITTING: Introduction to different fitting tools. Use and setting of fitting tools for marking, center punching, chipping, cutting, filing, drilling, their use, different measuring tools, Files – Material and Classification.

One job on fitting: involving operations like marking, filing, hacksaw cutting, drilling and tapping, making simple assemblies like a male-female type pair

III) TAPS & DIES: introduction to Taps & Dies, Different sizes of Taps & Dies their uses, holding instruments of taps & dies.

One job on taps & dies: Job involving, External and internal threads on plate or pipe, marking, center punching, cutting, filing, drilling

IV) SHEET METAL: Introduction to sheet metal tools, their use, different sheet metal joints, soldering, surface development. Specifications of metal sheets, Surface coatings; Operations like cutting, bending, folding, punching, riveting ; Joining by brazing and soldering.

One job on sheet metal: Job involving soldering operation like marking ,cutting, bending, joining operations of small sheet metal parts. Typical examples: sheet metal tray, funnel, dustbin, etc.

V) WELDING : Classification & brief introduction to welding processes- Arc, Gas and Resistance. Definition of welding, brazing and soldering processes, and their applications. Oxy-Acetylene Gas welding process, Equipment and Techniques, Type of flames and their applications. Manual metal arc welding technique and equipment, AC and DC welding Electrodes, constituents and functions of Electrode coating. Welding positions. Type of welding joint. Common welding defects such as cracks, undercutting, slag inclusions, Porosity

One job on welding: Job consisting of edge preparation for arc welding of different parts like lap welding of two plates, butt welding of two plates and welding to join plates at right angles.

VI) CARPENTRY : Brief study of various hand tools like chisel, saw ,planer. Timber, definition, engineering applications, seasoning and preservation, plywood and ply boards. Use of marking tools & hand tools such as marking gauge, try squares, steel rules, saws, jackplane, etc. Use of power tools, safety precautions.

One job on carpentry: Job like preparing a wooden joint; involving operations like wood sizing, planning, marking, sawing, chiseling and groove making. Use and setting of hand tools like hack saw, jack plane, chisels and gauges for construction of various joints like T – Lap joint, Bridle joint ,Corner mortise joint, Dovetail / butt joint such as a tray, frame etc.

VII) MACHINE TOOLS AND PROCESSES : Introduction to different machining tools, different measuring tools.

One job on Lathe: Job involving marking, metal removing showing basic operations like plain turning, facing, step turning etc.

VIII) FOUNDARY : Molding sand , preparation of molding sand, pattern, core, runner ,riser cope & drag box.
One job on molding : Preparation of sand mould with pattern, core with runner riser

I□) PRINTED CIRCUIT BOARDS : PCB etching and drilling, tinning and soldering techniques. Assembly of Electronic components on the printed circuit board (PCB).

One job of PCB design: Job involving development of PCB for electronic circit which comprises of layout design , masking, etching , drilling, tinning & component soldering.

□) PLASTIC IN□ECTION MOULDING: Introduction, principle, equipment & its operation, mould introduction & setting, Safety precautions and demonstration of plastic injection molding process (Demonstration)

REFERENCES :

1. B. S. Raghuvanshi, A Course in Workshop Technology, Vol – I,Dhanapat Rai and Sons.
2. Hajara Choudhari, Elements of Workshop Technology, Vol – I, Media Promoters.
3. Gupta and Kaushik, Workshop Technology, Vol – I, New Heights.
4. Chapman, Workshop Technology, Vol – I, The English Language Book Society.
5. H.S.Bawa, Workshop Technology, Vol.-I, TMH Publications, NewDelhi.
6. S.K.Hajra Choudhary ,Elements Of Workshop Technology ,Media Promoters &Publishers Pvt.Ltd,
7. Workshop Technology, Vol I, II and III, Chandola S.P., Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
8. K.T. Kulkarni, Introduction to Industrial Safety ,K.T .Kulkarni ,Pune Reference Books
9. Hwaiyu Geng, Manufacturing Engineering Handbook ,McGraw Hill Publishing Co.Ltd.
10. Lawrence E.Doyle, Manufacturing Processes and Materials for Engineers ,Prentice Hall Inc.

NOTE : Journal should be prepared and submitted based on information of tools and equipments used, jobs prepared by using various tools, equipments, machines in the above trades of performance sections. The term work shall be assessed based on a) the record of attendance, b) Term work done, c) the written/ practical / oral tests on the term work to decide the depth of understanding. The term work is to be assessed weekly.

Practical Examination:
Practical examination will consists of actual preparation of one job from any of the above performance sections. Duration of examination will be 3 hrs. Total marks are 25, out of which 15 marks are for job preparation and 10 marks for viva voce which should be conducted when the students are on job.

2 SCT10 / 1B5 ENGLISH COMMUNICATION S□ILLS LABORATORY

Teaching Scheme: Practical: 4Hrs. / week
Examination Scheme : Internal Test :25 marks External Practical examination : 25 marks
Course Outcomes:

The learning outcome of students will be assessed through assignments, tests and final exams and most importantly through practical performances.

Through these tests, it would be revealed that students are able to reproduce their understanding of concepts/principles of communication in English language.

Students can present themselves well in front of large audience on a variety of topics. Moreover they get the knack for structured conversation to make their point of views clear to the listeners.

Practicals :
Exercise 1: Types of communication, barriers to communication, effective communication
Exercise 2: Foundation of language: grammaticality and acceptability, word power, accuracy and appropriateness.
Exercise 3: Assignment on vocabulary building & Writing skill :nature of writing, stages of writing (pre, while and post), qualities of effective writing, what makes writing poor, the what, howand why of writing, drafting, summarizing, letter writing, writing reports.
Exercise □ Speaking: pronunciation, stress, intonation and pauses, formal and informal expressions, conversation skills, presentation skills, business etiquette.
Exercise 5: Group Discussion- To study about group discussion technique.
Exercise □: Interview skill- To study about personal interview.
Exercise 7: Planning and Mot- To study how to plan and execute an activity in a group.
Exercise 8: Seminar skill- To study how to conduct and deliver a seminar.
Exercise 9: Conference – To study how to conduct conference.
Exercise 10: Interpersonal communication- Conduct an activity for social cause.
Exercise 11: Project- Writing class newsletter.
Reference Boo□s:

1. S. Mishra & C. Muralikrishna, “Communication Skills for Engineers”, Pearson Education.
2. T.M. Farhathullah , “Communication Skills for Technical Students”, Orient Longman.
3. Saran Freeman, “Written Communication in English”, Orient Longman.
4. Raymond Murphy, “Essential English Grammar (Elementary & Intermediate)”, CUP.
5. Shirley Tailor, “Communication for Business: A Practical Approach”, Longman Developing .
6. Krishna Mohan &MeeraBanerji, “ Communication Skills”, Macmillan.
7. R. C. Sharma & Krishna Mohan, “Business Correspondence and Report Writing”, Tata McGraw Hill.

Websites:
http://www.englishpage.com
http://www.english-4u.de/
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Appendix-B

A Guide to Induction Program

1 Introduction

*(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.*1 *This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)*

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond.

The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students.

The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

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1A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31 March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs.

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work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2 Induction Program :

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awarness, sensitivity and understanding of the self, people around them, society at large, and nature. 2

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

2Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gadhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

(1) IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

(2) IIIT Hyderabad was the first one to implement a compulsary course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

(3) Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member. Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 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 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. 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.

2.2 Creative Arts :
Every student would chose 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 everyday 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.

2.3 Universal Human Values :
It gets the student to explore oneself 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. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. 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. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.3

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.

3The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.□Literary
Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 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. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.□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.

2.7 Visits to Local Area
A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiari□ation to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. 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 facilties.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	***Activity***
Day 0	
Whole day	*Students arrive - Hostel allotment. (Preferably do preallotment)*
Day 1 *09:00 am - 03:00 pm*	*Academic registration*
04:30 pm - 06:00 pm	Orientation
Day 2 09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.`
12:30 pm - 01:55 pm	*Lunch*
02:00 pm - 02:55 pm	Director's address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods within the Induction Program. We first show a typical daily timetable.

Sessn.	***Time***	***Activity***	***Remarks***
	Day 3 onwards *06:00 am*	*Wake up call*	
I	06:30 am - 07:10 am	Physical activity (mild exercise/yoga)	
	07:15 am - 08:55 am	*Bath, Breakfast, etc.*	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups do Creative Arts
III	III 11:00 am - 12:55pm	Universal Human Values / Creative Arts	Complementary alternate
	01:00 pm - 02:25 pm	*Lunch*	
IV	02:30 pm - 03:55 pm	Afternoon Session	See below.
V	04:00 pm - 05:00 pm	Afternoon Session	See below.
	05:00 pm - 05:25 pm	*Break / light tea*	
VI	05:30 pm -06:45pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	*Rest and Dinner*	
VII	08:30pm - 09:25pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	***Session***	***Remarks***
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For3 days-interspersed(e.g.,3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book Reading / Lecture)	IV	*For 3-5 days*
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

Time	*Activity*
Last But One Day 08:30 am - 12 noon	Discussions and finalization of presentationwithin each group
02:00 am - 05:00 pm	Presentation by each group in front of 4other groups besides their own (about100 students)
Last Day Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.□Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentormentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a *student guide*, and for every 20 students, there would be a *faculty mentor*.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/disciplin e4.

Here we list some important suggestions which have come up and which have been experimented with.

3.□1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.□2 Follow Up – Subse□uent Semesters

It is extremely important that continuity be maintained in subsequent semesters. It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

□Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and metaskills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The *Induction Program* is designed 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.

The *Universal Human Values* component, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and

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4We are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept.

nature, and character to follow through. It also makes them reflect on their relationship with their families and extended family in the college (with hostel staff and others). It also connects students with each other and with teachers so that they can share any difficulty they might be facing and seek help.

References:

Motivating UG Students Towards Studies,
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18 June 2017

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